# The Great Basin Naturalist

Volume IX, 1948

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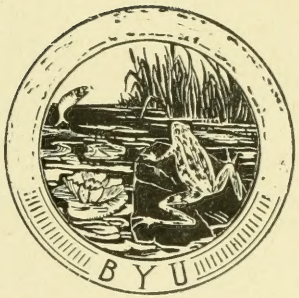
Vasco M. Tanner, *Editor*



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Vasco M. Tanner, *Editor*

C. Lynn Hayward, *Assistant Editor*

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Volume IX DECEMBER 30, 1948 Numbers 1-2

# PACIFIC ISLANDS HERPETOLOGY NO. 1
# MARIANA ISLANDS

## A New Species of Typhlops [1]

VASCO M. TANNER
Professor Zoology and Entomology
Brigham Young University

This is the first of several reports to be made on the amphibians and reptiles collected on the Mariana, Philippine, Dutch East Indies (Morotai), New Guinea, Australia, Admiralty (Los Negros) and Solomon Islands (Guadalcanal) by faculty members and students of the Brigham Young Universtiy, who were members of the United States armed forces between November, 1943, and January, 1946.

Great credit is due these men for their devotion to the project of collecting and shipping natural history specimens back to the univerversity. During this period the writer received and catalogued more than 2300 specimens of amphibians and reptiles, and 30,000 museum specimens of insects from these collectors. In order to avoid too much repetition as to the movements of each of the collectors and as to the areas where collecting was done, a brief summary of the military activities of each of the men who made major collections are given in this first report. Each summary starts with the date of enlistment and closes with the date of discharge of the several collectors.

### Captain D. Elden Beck

One of the largest collections from the Pacific area was made by Dr. D. Elden Beck, Assistant Professor of Zoology and Entomology, who volunteered as an entomologist and was inducted into service as a First Lieutenant on April 22, 1943. Lt. Beck received his academic training at Brigham Young University (A. B. 1929; M. A. 1930) and Iowa State College (Ph.D. 1933). He taught at Dixie College, St.

(1) Contribution No. 115, Department of Zoology and Entomology

George, Utah (1934-1937), and at Brigham Young University (1937-) until his enlistment.

Lt. Beck's assignments in the states were first, Camp Barkley, Abilene, Texas (April, 1943 to July 4, 1943) for basic training at the Medical Replacement Training Center; second, Ft. McPherson and Ft. Benning, Georgia (July 4, 1943 to December 11, 1943) for mosquito survey and control work; third, Camp Ellis, Illinois (Dec. 11, 1943 to January 14, 1944) where a malaria survey unit was organized with Lieutenant Beck in command; fourth, Camp Plauche, near New Orleans, Louisiana (January 14, 1944 to April 20, 1944) to receive training preparatory to going overseas; and fifth, he set sail from San Francisco on April 20, 1944 and arrived at Guadalcanal, Solomon Islands on May 19, 1944. During the year of continental service Lt. Beck made valuable collections of insects, amphibians and reptiles in Texas, Georgia, and Louisiana which he sent back to the university.

Collecting has long been a passion with Dr. Beck. For the twelve months (May 19, 1944 to May 22, 1945) spent on Guadalcanal, aside from his duties as director of mosquito control activities at the 20th Station Hospital on the Tenaru River, he distinguished himself in this capacity. He not only collected several hundred frogs, lizards and snakes, but made a good general collection of most of the insect orders. These specimens were so well prepared for shipping that very little loss resulted from breakage and damage. All the collecting was done within a radius of five miles of the hospital. This area is a low sloping plain consisting of swamps, grasslands, and jungles.

On May 22, 1945, Captain Beck (Lt. Beck was promoted to a captain in February, 1945) returned to the United States, arrived at San Francisco, California on June 19, 1945. From here he was sent to Camp Carson General Hospital in Colorado where he received medical care until October 10, 1945, when he was honorably discharged to return to his wife, four children, and the university.

### P.F.C. Ernest F. Reimschiissel

A large and most interesting collection of insects, amphibians, and reptiles was made at Guadalcanal, Admiralty Islands (Los Negros), Morotai, New Guinea (Hollandia), Australia and Leyte (30 miles south of Tacloban, near Dulag) and Luzon (Manila) in the Philippine Islands, by P.F.C. Ernest F. Reimschiissel. Mr. Reinschiissel was born in Germany July 21, 1917, and became a citizen of the United States through the naturalization of his father, Hugo Reimschiissel of American Fork, Utah. Ernest completed his grade and high school training

in American Fork and then attended Brigham Young University from which he graduated on June 4, 1940, with the B.A. degree, having majored in landscape architecture. In July, 1941, he was made an assistant in Landscape Architecture at the B.Y.U., which position he held until he was inducted into the army on January 5, 1943. His continental training was short. He was stationed at Fort Leonard Wood, Missouri three months before being sent to Pittsburg Replacement Camp, and Camp Stoneman, California, preparatory to being shipped overseas on April 29, 1943. He arrived in Noumea, New Caledonia May 18, 1943, and was assigned on May 26 by the Sixth Replacement Depot to the 12th Photo Intelligence Detachment of U.S.A.F.I.S.P.A.

Figure 1. South Pacific Island Collectors and Students. Seated, left, Ernest Reimschiissel; right, D. Elden Beck. Standing, left to right, James W. Bee, Doyle Taylor, Vasco M. Tanner, and Herbert H. Frost.

On November 20, 1943, Private Reimschiissel was ordered to leave for Guadalcanal by way of a Liberty ship. His new assignment was with the 13th Air Force doing work with the 12th Photo Intelligence Detachment. A.P.O. No. 709. While stationed at Lunga, nead Henderson Field, Ernest met Lt. Beck who interested him in collecting reptiles and insects. This soon became a most fascinating hobby which resulted in Ernest's shipping hundreds of reptiles and thousands of insects to

the writer. Although Mr. Reimschiissel had not previously made zoological collections, he did remarkably well in collecting and packing for shipping, with the improvised equipment, the thousands of valuable specimens from Guadalcanal. He left the Solomons on a baby flattop August 22, 1944, and arrived at Los Negros of the Admiralty Islands August 26, 1944. During his short stay on Los Negros, Ernest collected more than a hundred specimens of several species of lizards and some interesting weevils. He set sail from the Admiralty Islands on September 15, 1944, on a Liberty ship and arrived on Morotai Island in the Dutch East Indies, October 4, 1944. On this Island he engaged in some very profitable collecting, returning more than 300 specimens of amphibians and reptiles. Nine cigar boxes filled with layer after layer of insect specimens were collected and safely shipped to the university. After several weeks of exhausting maneuvers, Ernest was given a ten-day rest leave from Morotai to go to a rest camp at Mackay, Australia. He traveled by air, visiting the following places: overnight stop at Biak, January 14, 1945; two nights at Hollandia, New Guinea, arriving at Mackay, Australia, on January 17. While in Australia Ernest made some valuable collections. He was helped by Mr. J. H. Williams, who had a private natural history museum, and a Mrs. Thorpe. He left Mackay on January 28 to return to Morotai, but stayed in Hollandia until Febraury 5. During these several days in New Guinea, Ernest collected and made sketch drawings of more than fifty species of weevils. Soon after his return to Morotai he was assigned to the Air Evaluation Board, A.P.O. No. 925 at Brisbane, Australia, departing on February 19, 1945. This stay in Brisbane was short since he was ordered to leave for Leyte Island in the Philippines on March 1. He left Leyte for Manila on April 3, remaining here until September 11, 1945, when he was ordered back to the U.S.A. He received his honorable discharge papers October 6, 1945, returning to the Brigham Young University as an instructor in horticulture and landscape architecture and to his wife and baby boy.

Throughout Mr. Reimschiissel's sojourn in the South Pacific Islands, he devoted himself most assiduously to collecting insects and reptiles, sending 1000 amphibians and reptiles and from 8000 to 10,000 insect specimens to the university.

### Doyle Taylor — Technician 5th Grade

Doyle Taylor left Brigham Young University while a third quarter freshman and was inducted at Fort Douglas, Utah, on May 25, 1943. After a three month basic military training period, he was sent to Fitz-

simmons General Hospital at Denver, Colorado for study preparatory to becoming classified as a laboratory technician. This training was for a period of four months. From Fitzsimmons General Hospital he was sent to Camp Ellis, Illinois, and assigned to a malaria survey unit commissioned as the 45th Malaria Survey Unit.

The 45th Malaria Survey Unit was directed to Camp Plouche, near New Orleans, Louisiana. Here the unit underwent a four month malaria training program and was provided with all necessary equipment for service. Embarkation center for overseas duty was from Camp Stoneman, California.

First station overseas was at Guadalcanal, arrival date May 13, 1944. Here he became acquainted with Dr. D. Elden Beck in command of the 143rd Malaria Survey Unit. Encouraged by Dr. Beck, Doyle became interested in collecting various species of insects and reptiles which he sent to the Brigham Young University.

After sixteen months on Guadalcanal the 45th Malaria Survey Unit was sent to Cebu City, Cebu Island, Philippine Islands to do survey work in amoeboid dysentery. Later he transferred to a station hospital on Cebu where he worked in a parasitology laboratory.

In January, 1945, Mr. Taylor was ordered to Leyte, Philippine Islands, and from there to the separation center at Fort Douglas, Utah. He received his honorable discharge on February 4, 1946.

Mr. Taylor enlisted as a private and was separated with the rank of technician 5th grade. He married Barbara Mullen on March 21, 1947. He is now attending the Brigham Young University with a major in zoology and a minor in chemistry. He collected and sent many insects, amphibians and reptiles to the University from Guadalcanal and the Philippine Islands.

### Master Sergeant Herbert H. Frost

Herbert H. Frost was born on January 22, 1917, in New York City. His early education was in the elementary schools of that city and Rosemont, Pennsylvania. In 1930, he entered school in Long Island City, remaining until June, 1935, when he graduated from Bryant High School. Concerning his college training and military activities, Mr. Frost has furnished me the following:

"From 1937 until 1942 I attended the Brigham Young University, Provo, Utah. In June, 1941, I received an A.B. degree in zoology. The following year I completed requirements for a teaching certificate for the scondary schools in the State of Utah and commenced work towards a Master of Arts degree.

"On June 2, 1942, I was inducted into the Army at Fort Douglas, Utah. My basic training was at Camp Grant, Illinois from June until August of that year. While there I attended Sanitary Technicians School for five weeks and successfully completed the course of instruction. Upon completion of this work I was assigned to the newly organized 263d Medical Battalion, Third Engineer Amphibian Brigade (later changed to Third Engineer Special Brigade) located at Camp Edwards, Massachusetts. In November the Brigade moved to Camp Carrabelle, Florida (subsequently called Camp Gordon Johnston) for training in amphibian warfare. In April, 1943, the Brigade was sent to Fort Ord, California, for further training and assignment to an overseas station.

"On December 22, 1943, the 263d Medical Battalion and elements of the Third Engineer Special Brigade embarked at Oakland, California for the South West Pacific Area. After a twenty-six day voyage, the 263d Medical Battalion landed at Goodenough Island, sixty miles north of Milne Bay, New Guinea, on January 17, 1944. We remained there until the 6th of March, when we left for Finchhafen, New Guinea where we arrived on March 8, 1944. On July 23, 1944, our company left Finschhafen and proceeded to the Sarmi-Maffin Bay area, arriving there on July 27. Staging preparations were completed there on August 4 for the invasion of Sansapor, New Guinea. Landing at Sansapor on August 7, we remained there until December 26 when we were activated for the invasion of Luzon, Philippine Islands.

"The invasion of Lingayen, Luzon, took place on January 9, 1945, and our company was ashore by 10:30 A.M. and receiving patients by 1:00 P.M. From this date until the middle of May we were on the move southward every week or ten days. By May we had reached Santo Thomas, midway between Manila and Batangas. We remained at Santo Thomas until September 25, 1945, when we embarked for Otaru, Hokkaido, Japan. While in Japan we acted as occupation troops. On November 25, 1945, I left for the United States arriving in New York Harbor on January 3, 1946. On January 11, 1946 I was discharged from the army at Fort Devens, Massachusetts, with the grade of Master Sergeant which promotion was made in October, 1945, while stationed in Japan.

"In March, 1946, I returned to the Brigham Young University and resumed my studies where they had been interrupted four years previously. In June, 1947, I was awarded the Master of Arts degree in zoology. This coming fall I assume the duties of biology teacher at Ricks College, Rexburg, Idaho."

## James W. Bee

James W. Bee was sworn into the army at Fort Douglas June 25, 1941. He was assigned to the hospital corps and sent to Barnes General Hospital at Vancouver, Washington, for training in hospital administration and X-ray work. He remained at the Barnes Hospital until May, 1944, when he was ordered to Camp Barkley, Texas, for field hospital training. At Fort Sill he was assigned to 70th Field Hospital until he left Miami, Florida, by plane September, 1944, for Assam, India. He was stationed at Ledo until June, 1945, when the unit was moved to Kunming, China. He was then transferred to the 95th Station Hospital.

On October 14, 1945, Mr. Bee married Lt. Annette P. Malseed, of Albany, New York, a registered nurse with the 70th Field Hospital, in the St. Johns Episcopal Church in Kunming, China.

In December, 1945, he was assigned to Calcutta for his return to the United States. Mr. Bee was discharged from service January 14, 1946, at Fort Douglas, Utah.

While stationed in Washington, India, and China Mr. Bee collected some interesting butterflies, fishes and reptiles, which he kindly contributed to the collections at Brigham Young University. Mr. Bee graduated from the Department of Zoology and Entomology of the Brigham Young University with the degree of Master of Sciences, June, 1947.

## Other Collectors

Lt. George C. Cannon and Lt. Elden Rasmussen while stationed on Guam and Siapan, Mariana Islands, collected some reptiles which they contributed to the university.

Corporal William Weston made collections of insects and reptiles in New Guinea (Hollandia) and the Philippine Islands (Manila) which he shipped to the writer.

Ensign H-(s) Cluff E. Hopla contributed some specimens of parasites collected in New Guinea and the Philippine Islands.

Mr. Arthur Chapman contributed insects collected by him in North Africa and Germany.

Ensigns Ted Tibbetts and R. Robinson shipped a most interesting collection of reptiles to me from Fort Pierce, Florida on February 11, 1947. This collection was supplemented by another shipment of reptiles and insects made by Mr. Tibbetts around Gainesville, Florida.

Dr. Rex Thomas shipped to me more than fifty specimens of reptiles collected in Louisiana.

I am pleased to express my thanks to the above collectors and others who have been so mindful of their Alma Mater and have added valuable specimens to the zoological collections of the university.

## SOME MARIANA ISLAND AMPHIBIANS AND REPTILES

In this first paper the amphibians and reptiles from the Mariana Islands now in my possession will be discussed. I am also including a report on the species of Typhlops now in the university collection, along with observations on sixteen specimens from the Solomon Islands, now in the United States Museum, which are loaned to me through the kindness of Dr. Doris M. Cochran, Associate Curator of Reptiles. I wish to express my thanks to Dr. Cochran for the loan and use of these blind snakes.

The Mariana Islands consist of fourteen islands which form a chain extending more than four hundred miles. Guam, the largest island of the Mariana archipelago, is located at the southern end of the group, at N. Lat. 13° 26′, and E. Long. 144° 43′. Just northeast of Guam is Rita Island ,about thirty-five squares miles), then Tinian, (about twenty square miles), Saipan (about one hundred sixty-two square miles), and others. These islands discovered in 1521 by Fernando de Magellan were under the control of the Spanish until 1898 when Guam came under the control of the United States and the balance of the islands were sold to Germany by Spain. Following the First World War the Japanese have controlled all the Marianas except Guam which remained an outpost of the United States. The principal products of the islands are copra, coconut oil, cocoa, coffee, sugar cane, and fishes.

### BUFO MARINUS (LINNAEUS)

Linnaeus, Systema Naturae, 10th ed., Vol. I, p. 211. (Rana)

This species is represented by eleven specimens, numbers BYU 7650–7660, now in the Brigham Young University Herpetological Collection. One specimen number BYU 7650 is a large female with measurements as follows:

| | mm |
|---|---|
| Snout to anal area | 131 |
| Tip of fourth toe of extended hind leg to anus | 152 |
| Width of body at widest part of abdomen | 69 |
| Length of parotid gland | 39 |

Five of the ten juvenile specimens measure 39 mm in length. In these specimens the parotid gland measures 8 mm in length. Five

juveniles measure 35 mm in length while the parotids are 6 mm in length.

These specimens were collected by Lt. Elden Rasmussen in January, 1945, at Hq. 500th Bombardment Group, Saipan Island, A.P.O. 237. Lt. Rasmussen reported this species to be common on various parts of the island.

Stohler and Cooling, 1945, reported this species to be numerous around the cisterns at the town of Tenian on the island of Tinian. *Marinus* is also found on Guam having been introducted into many of the islands of the Mariana group. Loveridge, 1945, reports species of Bufo being introduced into many of the islands of the Pacific for the purpose of controlling insect pests. Fisher, 1948, lists *marinus* as "abundant on Ponape and on all the large islands of the Hawaiian group. Although present on all islands at Yap, it was most abundant near Yaptown, Yap Island, where apparently it was first liberated."

I also have specimens of this species, numbers BYU 6960–6968 and 7015–7017, from Guadalcanal of the Solomon Islands which were collected by Captain Beck in May, 1944.

### HEMIDACTYLUS FRENATUS (D. & B.)

Dum. and Bibr. Erp. Gen. III, 1836, p. 366.

Lieutenant Elden Rasmussen collected in January, 1945, on Saipan Island, a specimen, *H. frenatus,* number BYU 7661. When he sent it to the writer he reported that this species was common around the army barracks. Dr. John Van Denburgh reported this species from Guam in 1917.

### LEPIDODACTYLUS LUGUBRIS (D. & B.)

Dum. and Bibr., Erp. Gen. III, 1836, p. 304. *(Platydactylus)*

One specimen of this lizard number BYU 7662 was collected by Lt. Rasmussen in January, 1945, on Saipan Island. This species is widely distributed throughout the South Pacific Islands. Barbour, 1912, lists it from the Malay Peninsula, Borneo, Celebes, Halmahera, Papua, Solomon and Fiji Islands. This specimen has a length of 74 mm from the tip of the snout to the end of the tail. Lt. Rasmussen reports that specimens of this species were observed laying their eggs on the luggage in the army tents.

## GENUS TYPHLOPS OPPEL

Typhlops Oppel, 1811 Ordn. Rept. p. 54 (type *lumbricalis*); Boulenger, F.B.I. 1890, p. 235, and Cat. Sn. Brit. Mus. I, 1893, p. 7; Werner, Arch. Naturg. Berlin, LXXXVII, 1921, p. 271; Barbour, T. Mem. Mus. Comp. Zool., XLIV, No. 1, 1912, p. 97; Proc. N. Eng. Zool. Club VII, 1921, p. 107; Parker, H.W. Bull. Mus. Roy. Hist. Nat. Belgique, XV, No. 60, 1939, p. 4; Waite, E. R. Records So. Austr. Mus. Vol. I, No. 1, 1918, pp. 1-38; Smith, M. A. Fauna Brit. India, Ceylon and Burma, III, 1943, pp. 41-58; Taylor, E.H. Univ. Kans. Sci. Bull. XXXI, pt. II, No. 13, 1947, pp. 283-298.

A number of species of Typhlops, including a new one to science from Guadalcanal, are available for study at this time. Since these come from several localities of the area included in these studies I propose to deal with all the species in this first paper.

The family Typhlopidae consists of three genera and more than a hundred and seventy known species, the majority belonging to the genus Typhlops. Species of Typhlops are widely distributed throughout the South Pacific Islands, Australia, Tropical America, Eastern Europe, and Southern Asia. The other two genera Helminthophis and Typhlophis are represented by a few tropical American species.

The members of this family are called blind snakes since the eyes are concealed beneath translucent scales. They live under ground, feeding upon subterranean insects. It is believed that reproduction of all the species is by means of egg laying; in some of the species the embryos are well developed before being oviposited. The scales are highly polished and overlapping considerably, being uniformly the same on the dorsal and ventral parts of the body. The longitudinal body scales are in even rows. The color of all blind snakes is similar, being gray to brown above and flesh colored below. In preserving fluids the color becomes dark brown to black above and below yellow to white.

The family Leptotyphlopidae also known as blind snakes or worm snakes is represented in the United States by the species belonging to the genus Leptotyphlops, and in Utah by the species *L. h. utahensis*. These snakes are similar in appearance and habits to Typhlops. Their eyes are concealed under the ocular head scales. They feed on termites, ants, and other insects of the soil. The body scales are so highly polished that specimens are very difficult to hold when captured. They are able to escape their captor by rapid movements and burrowing into the sand and loose soil.

### TYPHLOPS BRAMINUS (DAUDIN)

Daudin, Hist. Rept. VII, 1803, p. 279 *(Eryx)*

Seven specimens of this blind snake numbers BYU 8067–8073 were

collected on the Island of Guam, south of the Yling River, on March 15, 1945, by Lt. George S. Cannon. Lt. Cannon reported that it was fairly common since many more specimens were observed than were collected. They were turned up when excavating for a camp.

Specimen number BYU 8067, the largest one of the lot, is 130 mm. long and 3.5 mm. in diameter at the posterior end of the body. There are twenty scale rows at about the middle of the body.

Two additional specimens of this species are in the collection. One number BYU 8098 is from Margritta, Assam, India. It was collected on April 19, 1945, by James W. Bee. The other specimen number BYU 7980 was collected at Manila, Luzon, Philippine Islands in July, 1945, by Ernest Reimschiissel. The scalation and color of the specimens of this widely distributed species agree remarkably well.

This species is widespread in its distribution, according to Dunn, 1931, the center of origin of the genus may possibly be "Old Northern," from which it has spread south and eastward.

Recently the species has been reported by Fisher, 1948, and Slevin, 1930, from the Hawaiian Islands; also from Mexico by Shreve, 1938, and from the Pacific Islands, Africa, Madagascar, etc., by Pope, 1935.

The nine specimens recorded in this paper are in the Herpetological collections of the Brigham Young University.

### TYPHLOPS FLAVIVENTER PETERS (Figs. 2 & 3)

Peters, Mon. Berl. Ac. 1864, p. 271

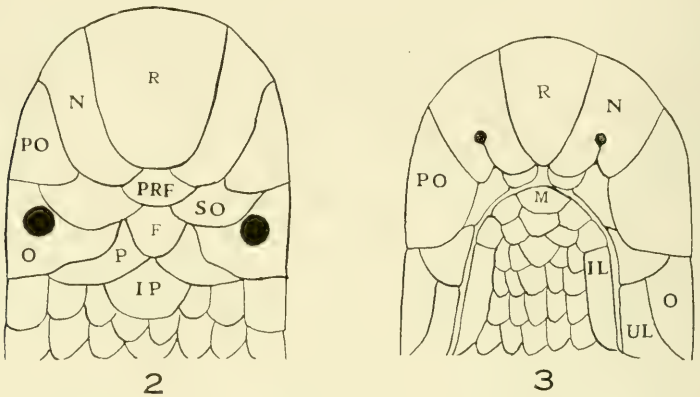
This localized species, *T. flaviventer* is represented by two specimens numbers BYU 7737–7738. They were collected on Morotai Island of the Molucca group, on December 14, 1944, by Ernest Reinschiissel and Lt. Hobbes. Specimen BYU 7737 has 22 scale rows around the body at the middle. The nine dorsal rows are blackish-brown; while the thirteen lateral and ventral rows are yellowish in color. The head is flattened and rounded, the rostral is large, nasal is small, with the nasal pores ventral; ocular is large, with the rudimentary eye distinct; upper labials four, infralabials three; total length of the preserved specimen 250 mm; tail 3 mm in length, ending with a small pointed spine; urosteges seventeen. Specimen BYU 7738 agrees with 7737 in scalation and color.

### TYPHLOPS DIVERSUS WAITE

Waite, Rec. South Austr. Mus., I, 1918, p. 31.

One specimen number BYU 7832 was collected at Guambi, Queens-

land, Australia, by J. H. Williams of Mackay, Australia. Mr. Williams gave the specimen to Mr. Reimschiissel in February, 1944, while he was visiting the Williams' Museum. This preserved specimen is 215 mm in length and is fairly uniform in diameter which is 3 mm at the middle of the body. The tail is 3 mm in length with eleven urosteges. There are twenty longitudinal scale rows around the body. The nasal cleft runs to the second upper labial. The color is uniform yellowish to white, with some traces of brown pigment in the dorsal and lateral scale rows.




Figures 2 and 3 — Head of *Typhlops flaviventer*
2. Dorsal view 3. Ventral view

The nomenclature of the head scales are as follows: F, Frontal; IP, Interparietal; M, Mental; N, Nasal; O, Ocular; P, Parietal, PO, Preocular; PPO, Posterior Preocular; PTO, Posterior Ocular; PRF, Prefrontal; R, Rostral; SUO, Subocular; SO, Supraocular; UL, Upper Labial; SL, Supralabial; IL, Infralabial.

## SOLOMON ISLANDS TYPHLOPS

Several species of Typhlops are now known from the Solomon Islands. The following is a key to the blind snakes of this group of islands:

I. Snout rounded in lateral veiw, nostrils lateral.
  A. 22 to 24 rows of scales round body. . *aluensis* Boulenger
  B. 20 rows of scales round body. . . . . *becki* n. sp.

II. Snout hooked in lateral view, nostrils inferior.
  A. Snout trilobed in dorsal view, 20 to 22 scale rows
  . . . . . *olivaceus reduncus* Barbour
  B. Snout rounded in dorsal view, 24 scale rows
  . . . . . *cumingii* var. *mansuetus* Barbour

III. Snout sharp pointed in lateral and dorsal views, not hooked.
A. Preocular not divided.
(1) 26 to 28 scale rows round body, 16 scales from vent to spine, 315 to 344 mm in length
.....*infralabialis* Waite
(2) 26 scale rows round body, 22 scales from vent to spine, 208 mm in length.....*bergi* Peters
B. Preocular divided, (in some specimens) 32 scale rows round body.....*solomonis* Parker

## TYPHLOPS ALUENSIS BOULENGER

Boulenger, Proc. Zool. Soc. of London, 1887, p. 336

In 1887 M. Boulenger described *T. aluensis* from a single specimen collected on Alu Island, which is located just off the southwest coast of Shortland Island. The type locality of this species is therefore about two hundred and eighty miles northeast of Henderson Field on Guadalcanal, the location where two specimens dealt with in this paper were collected. Barbour, 1921, reports a specimen of *T. aluensis* taken by Dr. Mann from Keri Keri on San Cristobal Island. Kinghorn (1928) reports that five specimens are in the Australian Museum Collection, two are from the Fiji Islands, one from the Government station, Ysabel Island, and one from Tulagi, and one without definite location. These records, along with the new records reported in this study, extend this species about 2600 miles south and well beyond Guadalcanal and establishes its range throughout the Solomon Islands.

Two specmiens of this species, before me, are numbers BYU 7102 and 7245. They were collected August 5, 1945, by Ernest Reimschiissel near Henderson Field, Guadalcanal.

Descriptions of *T. aluensis* by Kinghorn (1928) and Burt (1932) clearly set forth the characteristics of this species. Specimen BYU 7102 is dark brown on the back and sides. The under surface consisting of three scale rows are yellowish. The body measurements are as follows: total body length 200 mm; diameter of body 4.3 mm; tail length 10.5 mm; diameter of tail 3.5 mm. There are 22 longitudinal body scale rows and 23 urosteges. The nasal cleft extends to the posterior portion of the first upper labial. Eyes are distinct, showing through the large ocular scales which extend down between the second and third upper labials. The snout is rounded in lateral view. The nostrils are lateral. Specimen BYU 7245 is smaller with a body length of 174 mm; tail length 9.5 mm; body diameter 3.8 mm; body scale rows 22, urosteges 22. The color is similar in the two specimens.

Mr. Reimschiissel reports that specimen BYU 7102 was collected

in camp under an old water container. When the snake was picked up it wiggled vigorously and used its pointed tail as a defense mechanism.

Through the kindness of Mr. Walter C. Brown of Stanford University I have been permitted to examine a specimen of *T. aluensis*. This specimen from the Stanford University Natural History Museum

| Number | Scale rows | Urosteges | Total length | Locality | Collector |
|---|---|---|---|---|---|
| | | | | Torokina | |
| 120212 | 24 | 21 | 209 mm | Bouganville Is. | Necker and Gurney |
| 120213 | 23 | 21 | 187 mm | " " | " " " |
| 120214 | 22 | 21 | 149 mm | " " | " " " |
| 120215 | 24 | 21 | 98 mm | " " | " " " |
| 120216 | 22 | 18 | 153 mm | " " | " " " |
| 120217 | 24 | 21 | 92 mm | " " | " " " |
| 120218 | 24 | 21 | 185 mm | " " | " " " |
| 120219 | 24 | 21 | 198 mm | " " | " " " |
| 120220 | 23 | 21 | 160 mm | " " | " " " |
| 120221 | 24 | 20 | 210 mm | " " | " " " |
| | | | | Doma Cove | |
| 122327 | 22 | 20 | 111 mm | Guadalcanal | O. A. Muenninck |
| 81893 | 22 | 20 | 204 mm | Tulagi Island | K. R. Sternson |
| | | slightly | | | |
| 81894 | 22 | 15 injured | 195 mm | " " | " " " |
| 76824 | 22 | 21 | 163 mm | Malaita Island | S. M. Lambert |

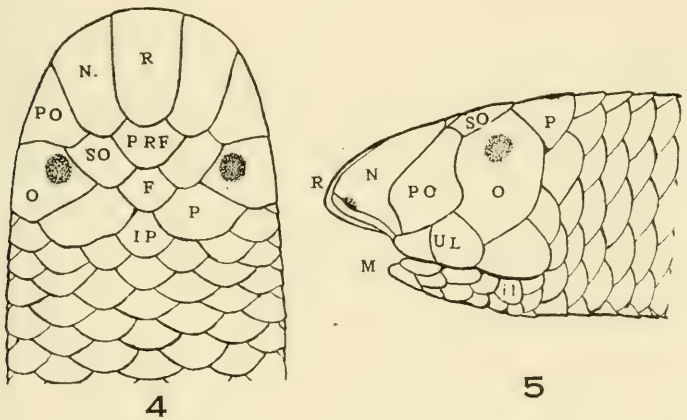
is numbered 11031 and was collected in the Terete area of Guadalcanal in February, 1944, by J. R. Heath. It is a plump well preserved specimen with 22 body scale rows, 21 urosteges, a body diameter of 6.5 mm and a total length of 237 mm.

I have also had the opportunity of examining fourteen specimens from the United States National Museum. The scale counts and measurements are recorded in the table above.

Burt (1932) considers Werner's *T. philococos,* described from Ralum, Bismarck Islands, as a synonym of *T. aluensis.* It appears that Werner failed to consider Boulenger's description which appeared eleven years before.

TYPHLOPS BECKI TANNER, new species (Figs. 4 & 5)

TYPE: head oval, when viewed from above; flat back to the frontal, 3.2 mm in length; snout projecting 1.8 mm beyond the mental, rostral




Figures 4 and 5. Head of *Typhlops becki,* new species

4. Dorsal view 5. Lateral view

(See Figures 2 and 3 for nomeclature of head scales.)

with parallel sides, width same as dorsal portion of nasals, not reaching back to level of eye; suture dividing anterior part of the nasal, not reaching to the preocular; anterior division of the nasal not seen from above; nasals extending beyond the rostral; nasal cleft extending to the anterior part of the second upper labial; prefrontal larger than the frontal. Supraoculars about half the size of the parietals and in contact with the nasals, prefrontal, frontal, parietals, ocular and preocular;

oculars in line with the posterior margins of the third upper labial; infralabials three; upper labials four, eye shielded by the ocular, which comes in contact with the second and third labials; the preocular contacts the first and second labials.

Body scales in twenty longitudinal rows; scales slightly wider than long; dorsal and ventral scales same in size. Transverse body scales 206, urosteges 14; six preanal scales transparent and similar in size. Body length 112 mm; tail 5 mm; body diameter 4.8 mm.

Color above dark brown, ventral light brown, head pale grey, eyes light grey with black pupils. Terminal spine of the tail small and blunt.

Type Locality: Specimen number BYU 7448, collected in the jungles near the 20th Station Hospital on the Tenaru River, northeast portion of Guadalcanal, Solomon Islands, November 30, 1944 by Lt. D. E. Beck and P.F.C. Ramey. Described from a single specimen which is deposited in the Herpetological Collection at the Brigham Young University.

Comparison: *Becki* is related to *aluensis* from which it differs as follows: body scales in 20 rows, narrower rostral, larger parietals and oculars, nasal cleft extending to second upper labial; broader third upper labial, fourth labials smaller and different in shape, tail shorter, hence fewer urosteges, ventral color darker.

Smith, 1943, comments on the peculiar gland-like structures, previously reported by Haas, as occurring in the epidermis of the head of most of the Indian species of Typhlops. These gland-like structures are present in *becki* being found under the margins of the dorsal head scales.

Remarks: Concerning the conditions under which this species was collected I quote the following from Dr. Beck's field notes:

> "While clearing the leaves away from a clearing in the jungle area this snake was discovered. It apparently was but a few inches below the surface of the soil.
>
> "In the living state the snake is a silvery grey and possesses a slick surface. After preservation in a 70% alcohol with a few drops of formalin added, a light brown color appears.
>
> "After the snake was discovered it did not crawl away but flipped excitedly like a fish on dry land."

### TYPHLOPS OLIVACEUS REDUNCUS BARBOUR

Barbour, Proc. New Eng. Zool. Club VII, 1921, pp. 107-8, Pl. V

It is questionable if Barbour's subspecies *reduncus* should be retained as a valid form or placed in synonymy in accordance with King-

horn, 1928. My examination and comparison of a single specimen No. 122328 from the United States National Museum with drawings of *T. alivaceus* (Kinghorn, 1928, p. 138) leads me to conclude that *reduncus* should be considered as a good subspecies for the present. When several specimens of *olivaceus* and *reduncus* can be brought together for comparison a decision may then be reached. Kinghorn did not examine a specimen of *reduncus* from the Solomon Islands. The specimen in hand has a "longer and more sharply produced rostral and a much more conspicuously developed ornamentation of excrescences" than is shown in the drawings of *olivaceus* after Peters. The excrescences are very noticeable under the microscope, being even more widely distributed than in Barbour's drawings. The National Museum specimen from Doma Cove, Guadalcanal, has 20 scale rows, 23 urosteges, and is 358 mm in total length.

### TYPHLOPS CUMINGII VAR. MANSUETUS BARBOUR

Barbour, Proc. New Eng. Zool. Club, VII, 1921, pp. 108-9, Pl. VI

Specimens of *T. c. mansuetus* are not available for study. Burt, 1932, chose to reserve his opinion of Barbour's two subspecies until a study could be made of a number of representative specimens. Kinghorn, 1928, placed this form in synonymy. A future problem is that of studying additional specimens of these two forms from the type locality, Keri Keri, San Cristobal Island, along with a series of specimens of *olivaceus* and *cumingii,* both of which are reported from the Philippine Islands. The types of Barbour's two subspecies are in the Museum of Comparative Zoology, Cambridge, Massachusetts.

### TYPHLOPS INFRALABIALIS WAITE (Figs. 6 & 7)

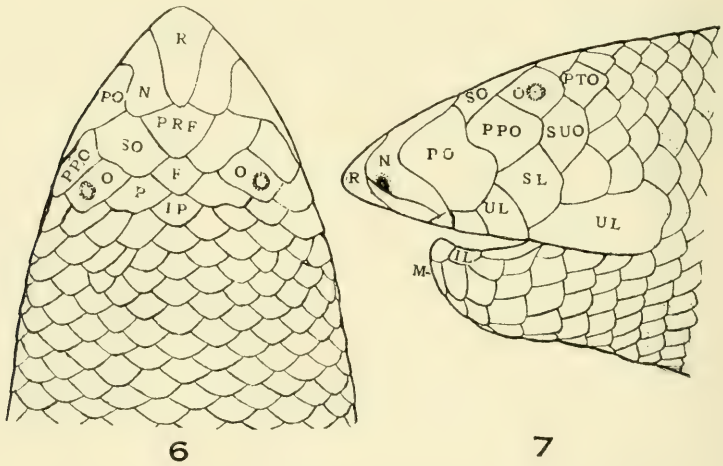
Waite, Rec. South Austr. Mus. I, 1918, pp. 35-63, Fig. 25.

*Typhlops infralabialis* is a large strikingly marked worm snake. The mouth is inferior, rostral and nasals prejecting dorsally beyond the mental. The nasal cleft extends to the posterior half of the first upper labial. Eyes indistinct, hardly showing through the ocular scales There are twenty-six longitudinal scale rows around the body. Six to eight ventral ones are yellowish, while eighteen to twenty dorsal and lateral rows have scales with brownish central spots surrounded by light borders. This gives a distinctly uniform spotted appearance. The measurements of this preserved specimen are: total body length 344 mm; diameter of the body at the middle 7 mm; tail 8 mm in length, 6 mm in diameter just posterior to the anus. There are sixteen uro-

steges from the anus to the short pointed tail spine.

The following comments concerning this specimen are taken from Dr. Beck's field notes:

> "July 24, 1944, No. 217. Lowell Adams had taken, as well as had brought to him four worm snakes, one of which he gave to me and which I list under this number. I was particularly interested in a color difference between specimens. He had two large and two small specimens. One large specimen was dark brown, the pattern of the individual scales indistinct. The other specimen was light colored (tan), the tiny hexagonal pattern is very distinct. The same condition was present in the smaller specimen. I would say it is either a sex difference or there may be two different species in this area. All the specimens were found under objects, trees (dead), boxes or other trash in the camp area. It is of interest to note that I have turned over hundreds of logs in the forest jungle and in various areas of the grass jungle, but I have not found this species."




6 7

Figures 6 and 7. Head of *Typhlops infralabialis*

6. Dorsal view 7. Lateral view

(See Figures 2 and 3 for nomeclature of head scales.)

One specimen No. BYU 7040 is in the collection. It was collected by George Nazaruk, June 21, 1944 near Nalimbu River, Guadalcanal, Solomon Islands. It was given to Lowell Adams, 6th Photo Intelligence Unit who is a graduate of the University of California and who collected vertebrates on Guadalcanal.

### TYPHLOPS BERGI PETERS

Peters, Occ. Pap. Mus. Zool. Univ. Mich. No. 508: 1-3, Pl. I, Figs. 1, 2.

*Typhlops bergi* recently described from a single specimen taken at Segi Point, New Georgia Island, is closely related to *T. infralabialis*. *Bergi* may be characterized as follows: scale rows in twenty-six rows, scales with brown centers, the spots surrounded by light borders; a large ocular, three supraoculars, two temporals, and a large recognizable parietal; nasals separated by the rostral, nasal suture runs to second upper labial. I have not seen a specimen of *bergi*. The type is in the Museum of Zoology at the University of Michigan.

### TYPHLOPS SOLOMONIS PARKER

Parker, Bull Mus. Roy. D'Hist. Nat. Belg. 1939, Tome XV, No. 60, p. 4.

*Typhlops solomonis* is closely related to *T. infralabialis*. It was described by H. W. Parker in 1939 from a specimen taken at "Buin, ten miles inland on Bouganville, Solomon Islands, by Reverend J. B. Poncelet, 2 VI-38." I have been permitted to examine a specimen of this species from the United States National Museum which was collected by W. T. Necker at Torokina, on Bouganville Island. This specimen No. 120211 is 323 mm in total length with thirty-two longitudinal body scale rows and sixteen urosteges. The scale pattern and color is similar to *infralabialis*. It does not have a divided preocular as shown in Parker's drawing; instead the preocular is one large scale as in *infralabialis*. I, therefore, do not consider this as a good character for separating *solomonis* from *infralabialis* as employed by Parker. The type of *solomonis* is in the Musee Royal d'Histoire Naturelle de Belgique.

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# DIPTEROUS PREDATORS OF THE MOSQUITO IN UTAH AND WYOMING

FRED C. HARMSTON, S. A. Sanitarian (R)
United States Public Health Service

The brackish marshes bordering the Great Salt Lake are prolific mosquito breeding areas; they also are the habitat of predaceous flies which find a plentiful source of food in the mosquito larvae and pupae that become stranded in shallow water and mud during the dry periods of late spring and early summer. Inspections conducted in this area during May and June of 1945 and 1946 afforded the writer several opportunities to observe five species of predaceous flies which were preying on mosquito larvae and pupae.

The observations were made at a time when the marginal areas of the extensive marshland were rapidly drying out, resulting in a heavy concentration of larvae and pupae in the shallow water of numerous pools. Many pools had evaporated until all that remained was a mass of squirming larvae and pupae, while hoofprints and similar isolated depressions had become entirely dry, causing the extinction of myriads of immature mosquitoes. Cast pupal skins covering the surfaces of some breeding places and hordes of adult mosquitoes which arose when disturbed in their resting places in the salt grass indicated that a tremendous mosquito population already had emerged from the vast marshland.

Adult mosquitoes collected in the area with an insect net showed approximately 60 per cent to be *Aedes dorsalis* (Meigen), 30 per cent *A. niphadopsis* Dyar and 10 per cent *A. campestris* Dyar and Knab. Larvae of the three species were found inhabiting the same brackish pools in a number of instances.

While examining the mosquito breeding places my attention was attracted by the presence of large numbers of predaceous flies which were capturing and feeding upon the larvae and pupae. The predators were particularly numerous in situations where the rapid drying of breeding places was leaving the larvae and pupae stranded on mud or concentrated in shallow water. The majority of the flies were running about over the mud, or were exploring moist cracks and crevices from which wriggling larvae and pupae were being extricated; others were "skating" across the surface of the shallow pools, examining various small objects floating on the water, in search of food.

Of the five species of predaceous flies under observation the most numerous were *Ochthera mantis* (DeGeer), of the family Ephydridae. This species is abundant in many localities near Salt Lake City and is readily identified by the greatly incrassated, heavily-spined anterior femora. The other four predaceous species, belonging in the family Dolichopodidae, were identified as *Hydrophorus gratiosus* Aldrich, *Thinophilis spinipes* Van Duzee, *Tachytrechus granditarsis* Greene and *Dolichopus nigricauda* Van Duzee. The last named species previously has been reported feeding on mosquito larvae in the Alamosa, Colorado area, by Bishop and Hart.

The ephydrid flies and the two dolichopodids, *H. gratiosus* and *T. spinipes,* were observed to employ their heavily-spined, prehensile fore legs in seizing their prey and manipulating it during the feeding process. The other two species of dolichopodids merely seized their prey by means of the large suctorial flaps which surround the protuberant proboscis. The anterior legs of the latter two species are not prehensile and were seldom used in holding or manipulating the prey which, in the case of small mosquito larvae, were entirely engulfed in the remarkably enlarged and modified mouthparts. Large, vigorously wriggling larvae and pupae that could not be wholly engulfed were held securely while the body fluids were being consumed.

These predaceous flies were observed to be amazingly adept at capturing mosquito larvae and pupae in shallow water. However, they were seldom observed to capture larvae or pupae where the water was of sufficient depth to afford the latter a means of escape. This might indicate that these dipterous predators are of little significance in the biological control of mosquitoes in situations where depth of water is great enough to permit freedom of movement for the larvae and pupae.

It has been reported by Mr. L. P. Nielsen, that pupae of *A. dorsalis* may remain alive in the moist holes and cracks of a pond several days after the water has disappeared, and that 25 to 30 per cent of the pupae in such situations may survive and become adults. Where such conditions obtain, as is frequently the case over wide areas in the extensive marshlands surrounding Great Salt Lake, these dipterous predators undoubtedly destroy large numbers of larvae and pupae and probably play a minor role in the natural control of mosquitoes. Bishop and Hart report that 93 mosquito larvae were accounted for in a period of 7 days, mostly by two small dolichopodid flies, identified as *D. walkeri* Van Duzee.

Two species of Asilidae have been observed by the writer to capture and feed on adult mosquitoes. These were identified through the

kindness of Dr. Stanley W. Bromley as *Cyrtopogon willistoni* Curran and *C. bimacula* Walker. The former species was observed preying on mosquitoes at Garden City, Utah, on August 10, 1946; the latter at St. Charles, Idaho, on July 11, 1945. The voracious asilids apparently had little difficulty capturing the mosquitoes in mid-air, and would repeatedly discard freshly-caught prey in order to pursue and capture new victims. Mosquitoes discarded by the predators were picked up by the writer and later identified as *Culiseta inornata* (Williston).

It is hoped that the notes given here, and those to be found in articles listed in the bibliography, will help to stimulate the interest of other workers whose observations may supplement our present inadequate knowledge concerning the natural enemies of the mosquito.

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### Strawberries Damaged by a Diplopod

An introduced diplopod, *Nopoiulus minutus* (Brandt) was found damaging the strawberry fruit in Provo this summer. This small worm-like thousand-leg creature which is about 10 mm in length and 1 mm in diameter attacks the ripe berries which touch the moist soil. As many as a dozen *N. minutus* were taken from a single berry and most the berries touching the ground were infected. This organism ordinarily lives in the soil feeding upon plant and animal matter. It is hoped that it will not prove to be a serious pest to strawberry growers in this area. At present it is not known just how widespread it is in Utah. Dr. R. V. Chamberlin (Proc. Biol. Soc. Wash., 34, 1921, pp. 83-84) reports that it is common in New England and Atlantic seaboard states, but not in the western states. In fact this seems to be a new record of its occurrence in Utah. Dr. Chamberlin determined the species for me.

Fruit inspectors should check berries in the future to see if they are infected by this European diplopod.

—Vasco M. Tanner

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# PACIFIC ISLANDS HERPETOLOGY NO. II
## PHILIPPINE ISLANDS [1]

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In this second report on the Pacific Island Herpetology we are concerned with the Philippine Islands which lie almost due west from the Mariana Islands with which the first paper dealt. This group consists of hundreds of islands located between North Latitude 5° and and 22°, and between East Longitude 117° and 127°. Specimens of amphibians and reptiles were collected on three of these islands namely, Luzon, Leyte, and Cebu. Luzon is the largest island in the Philippine group having a surface area of 40,814 square miles. Manila is the largest city in the Philippines and is situated on one of the excellent harbors of the Malay Archipelago. Leyte is the eighth island in size with an area of 2,799 square miles, Tacloban is the principal city. Cebu is next to Leyte in size being an elongated island of 1,695 square miles. Cebu City, the largest city of this island, and the first European settlement in the Philippines, is on a small natural harbor. Several of the collectors mentioned in the previous study shipped specimens from these islands to the writer at Brigham Young University.[2] Ernest Reimschiissel made valuable collections at Tacloban and Manila; Herbert Frost, William Weston, and Cluff Hopla were stationed on Luzon Island. Doyle Taylor was attached to a hospital in Cebu City, this being the only island where he had an opportunity to collect.

The Spanish explorer Magellan discovered the Philippine Islands in 1521, and these remained under Spanish control until 1899, when by the Paris treaty they were put under the control of the United

(1) Contribution No. 116, Department of Zoology and Entomology.
(2) The Great Basin Naturalist, Vol. IX, No. 1-2, Dec. 30, 1948. Mariana Islands, pp. 1-20.

States. This control passed into the hands of the Filipinos in 1946 when they were given their independence and the Philippine Republic was established.

The climate of the Philippines, although tropical, is a pleasant one. The annual temperature averages about 79°. The cool breezes make the hottest months, April and May, very agreeable. The total area of this group of islands is 114,400 square miles, with a population in 1939 of 15,984,247. The chief exports are sugar, hemp, coconut oil, copra, tobacco, lumber, and embroideries.

## DERIVATION OF THE HERPETOLOGICAL FAUNA OF THE PHILIPPINE ISLANDS

Much has been written on the cryptic subject of the origin and distribution of the cold-blooded vertebrates, but very little dependable information has been brought forth. One who seriously studies the animal life of the Philippines, Moluccas, New Guinea, and the Solomon Islands is at once confronted with the problem of geographical distribution. Such students of this subject as: Wallace, 1881; Beddard, 1895; Barbour, 1912; Taylor, 1922; Schultze, 1929; Matthew, 1939; Myers, 1943; and Darlington, 1948, while not in agreement, yet, they have arrived at some conclusions that are fairly well supported by present-day knowledge of reptile distribution.

In order that the thinking of some of the above authorities on this subject may be brought to the attention of the reader excerpts directed to an understanding of the geographical distribution of animal life on the Philippines are included in this paper.

From Thomas Barbour's notable "Contribution to the Zoogeography of the East Indian Islands" we extract the following:

"The relation of the Philippines to Halmahera is a question which still awaits solution. It seems possible to project the line of recent volcanoes through Halmahear up to Mindanao; in which case land may well have existed along a similar line. Lines of recent extensive faulting often give rise to volcanoes, and this may have been the case here. Such a connection, however, can hardly be urged as a substitute for the Celebes-Halmahera Bridge. The types which suggest immigration from Celebes do not occur among the southern Philippines, except for some on Palawan. The relation of Mindoro to Celebes, suggested at once by the distribution of the pigmy buffaloes, is, according to Bartsch, also evident from a study of the land-snails. Mindanao, with a fauna different from that of Celebes and Mindoro, must needs be of more recent origin. It has probably replaced, by having been lifted again from the sea, some of the land which became submarine between Celebes and Mindoro; and, joining with other islands, re-

ceived a typical Malayan fauna from Borneo, and some Celebesian types from small islands that may have represented unsubmerged mountain peaks of the older land mass and that supported some of the types common to Mindoro and Celebes. The Papuan element in the amphibian fauna of Borneo may be a true relic fauna; for the engystomatids, which exhibit such a very noteworthy elaboration in Papua, may have come from Borneo to Halmahera through the southern Philippines. Mindanao and Halmahera both support a number of engystomatid genera; but these forms are not abunnant in Celebes, nor, as far as we know, in the Lesser Sunda chain, where we would expect to find more of them if they got to Papua by this route. The few occurring there represent probably what is really a back-flow from Halmahera. Borneo is well known herpetologically; but these small, inconspicuous frogs are very difficult to collect, and many may yet remain undiscovered both here and in the southern Philippines."

Concerning the faunal relations and distribution of Philippine snakes E. H. Taylor has reported as follows:

"The herpetological faunas of the Philippines, particularly the ophidian fauna, are derived from a variety of sources, but undoubtedly their greatest affinity is with Borneo. A casual glance at a map shows the Philippines joined to surrounding land bodies by a series of island chains, five or six in number.

To the north there is but a single chain comprised of the Babuyan and Batan Islands. This chain reaches nearly to Formosa, which in turn is joined with Japan through the Riu Kie Island group. To the south and southwest there are no less than three island chains that connect with Borneo. The most important of these three is the Palawan Island group, including the Calamianes, the Cuyo Islands, Palaway, and Balabac. The second chain, not so clearly defined as the former, comprises the Cagayan Islands, the Cagayan Sulu. The third chain which approaches more nearly to the mainland is the Sulu Archipelago, which includes a number of island groups, and the larger islands Basilan, Jolo, Tawitawi, with numerous small islands. As might be suspected the Philippines have far more genera and species in common with Borneo than with any other land body. To the south there is a second chain which divides, one branch connecting with Celebes through the Sanghir Islands, and the other with Gilolo, and the Moluccas, through Talaur, and Morotei.

There are thirty-three recognized genera of land snakes known to occure in the Philippines, and five of these are endemic. They are Oxyrhabdium, Cyclocorus, Haplonodon, Typhlogeophis, and Hologer rhum. The first genus has two known species; each of the other four is represented by a single species."

Dr. Myers' observations on the probable origin of the Philippine discoglossid frog, *Barbourula busuangensis* are of interest at this point. We quote the following:

"Superficial examination seems to confirm Taylor and Noble's suggestion that the closest known rleative of *Barbourula* is *Bombina* of the Eurasian mainlands. *Barbourula* shows no sign of the gay belly marbling of *Bombina* (bright red in *B. bombina* and *B. orientalis*, bright yellow in *B. variegata* and *B. maxima*), and it is very different in many other ways. Its geographical situation alone shows that *Barbourula* must have been widely separated from its relatives on the Asiatii mainland for a long time. Geographirally, *Bombina maxima* (of Yunnan and the highlands of Tonkin) is the closest species, but whatever migration routs was followed by *Barbourula* was much longer than its present air-line distance from Tonkin. The Calamianes and Palawan have had, in my opinion, no direct dry land connection with the other Philippine islands to the north and east, or with IndoChina. They are related zoogeographically only to Borneo, of which they form a northward continental extension, and they have been cut off from Borneo by the sea only in relatively recent geological times. The ancestors of *Barbourula* must have arrived via the main Malay Archipelago at a time when Sundaland was upraised, and the present absence of Discoglossidae in Borneo and the Sunda chain, as well as in the Malay Peninsula, Siam, and most of Indo-China, indicates that *Barbourula* is an exceedingly isolate relict."

The origin of the Philippine fauna may be more clearly understood if information on the geographic distribution of other animal species than the amphibians and reptiles is considered. W. Schultze, a noted student of the Curculionidae, has dealt with the distribution problem from the point of view of the pachyrrhynchids, a group of weevils.

The family Curculionidae, to which the pachyrrhynchids belong, is the largest family of Coleoptera, and are world wide in their distribution. In the Philippine Islands between eight and nine hundred species of weevils have been described of which about 37 per cent are pachyrrhynchids. This peculiar and unique group of weevils, that are so limited in their distribution, are represented by 14 genera and 344 species; 11 genera and 309 species are restricted to the Philippines of which 9 genera are endemic to the Archipelago and 5 genera endemic to Luzon.

Schultze's conclusions are as follows:

"The Philippines were connected with the mainland of Asia (possibly through Formosa, possibly through a now completely obliterated formation) at a very early period. During this time indigenous species now found in the uplands entered Luzon. Then a separation occurred, between Luzon and the land north of it at least. After the first break the Philippine Islands still were connected with each other, with the exception of Palawan. The Philippine Islands, through the eastern chain by way of Mindanoa, were connected with the Moluccas, Celebes, and probably New Guinea and some of its nearby islands. During the

same period the invasion and distribution of Papuan-Malaysian elements, such as the ancestral derivative forms of Lepidoptera and pachyrrhynchids, as mentioned before took place. Ths invasion must have extended over a long period of time during which some of the Papuan forms reached as far as northern Luzon, the Riu Kius being at that time, together with the Babuyanes, probably connected with Luzon. After that long period of stability the Philippines were the first to be separated from the rest of the Malay region, the break occurring at the junction near the Moluccas. At that time also it seems that the Philippine Islands became isolated from one another and assumed practically the island character of to-day. At the period when the Philippines were isolated from the rest of the Malay region, probably Celebes, Java, Sumatra, Borneo, and Palawan were still connected with each other. During the last period the various endemic genera developed, particularly in the pachyrrhynchids."

An analysis of the weevil fauna of the Mariana Islands to the east of the Philippines reveals a fauna at present of 49 species; 73 per cent of which are endemic. According to E. C. Zimmerman, 1942, this fauna had its origin from ancestral stocks derived from the Solomons, New Guinea, and the Philippines. The sub-families Cossoninae, Cryptorhynchinae, and Otiorhynchinae common throughout oceania are the predominant ones in the Marianas. The reptiles reported as occurring on Guam by Van Denburgh, 1917, are common species in the Philippines, Moluccas, and the Solomons. How these fauna were once connected is not now known.

As to the center of origin and dispersal of the cold-blooded vertebrates, Darlington, 1948, page 105, takes issue with Matthew's contention that this took place in the north temperate zone. Darlington believes:

"Fresh-water fishes, amphibians and reptiles seem all to have dispersed from the tropics into the north temperate zone, more than the reverse. Some of them that have been in the north have withdrawn from there, but that does not mean that they originated there. Failure to distinguish evidence of withdrawal from evidence of origin and spreading is a basic error. The north temperate zone, especially its colder parts, is apparently not a great center of evolution or cold-blooded vertebrate life, but a marginal area where such life is limited."

The point of view of Darlington seems to especially apply to the cold-blooded vertebrates, and it is this belief which I have adopted in this study.

In the light of the above opinions we may, therefore, be justified in concluding that the herpetological stock from which the present species were derived came from the south tropical zone northward over preexistant land connections. There were, on the other hand no doubt,

southward withdrawals during the past. This transgressive and regressive movement of the fauna has left relic species strewn throughout the present island groups. From the early Tertiary times, during the Eocene to the middle of the Miocene, geological evidence points to land connection of the Philippines with island groups to the south.

According to Smith, 1910, no sedimentary formations have been found that are older than the Eocene. From Smith's summary of the geological history of the Philippines we extract the following from Mr. George F. Becker's remarks:

"From early Paleozoic times onward an archipelago has usually marked the position of these islands. Prior to the Eocene nothing definite is known of them . . . After the Cebuan lignitic epoch a great uplift and folding took place, and this may have been a detail of the late Eocene movement which so profoundly modified Asia and Europe. It must have brought about temporary continuity of land area between Borneo and Luzon."

Smith also pointed out in 1907, that the Pleistocene sediments of northern Luzon show no evidence of glaciation.

The fact that many endemic cold-blooded vertebrates, as well as weevils, are found in the Philippines suggests a rather old and isolated fauna; one that has been isolated since Oligocene or Pliocene times.

At present the Philippine reptiles affinity is southern more than northern. It is a fauna in which there are large generic affinities with Southern Island species.

It is of interest to note that in this issue a species of Pseudogekko from Gaudalcanal, Solomon Islands is described as new. This is the second known species of this genus to be discovered and since its habitat is tropical, but south of the equator, it suggests a connection of these areas at some time in the recent past.

## LIST OF PHILIPPINE AMPHIBIANS AND REPTILES CONSIDERED IN THIS STUDY

The Philippine Islands have a large and interesting herpetological fauna. Several hundred species have been recorded as occurring in these islands. The species reported here are, in the main, common ones. My major purpose in preparing this report is to make known the following Philippine species as occurring in the Brigham Young University Herpetological Collection. A large portion of the preserved collections in the Bureau of Science at Manila was destroyed in the recent war. Now that the Filipinos have charge of the research and

educational programs in the Islands, zoological materials may not be studied as systematically as during the past fifty years. It therefore seems to be desirable to know the location of Philippine and Oceanic herpetological specimens.

## AMPHIBIANS

### Family Ranidae

### OXYGLOSSUS LAEVIS GUNTHER

Gunther, Cat. Batr. Sal. Brit. Mus. 7, 1858, pl. 1, fig. A.

BYU 7932-36 Manila, Luzon (E. Reimschiissel) May, 1945

Remarks: This species was well described by Dr. Taylor, 1920, p. 230. The five specimens are from 23 mm. to 35 mm. in body length; color above brownish with small elongate tubercles on posterior back and outer tibia; under surface of throat and legs mottled with brownish spots; no yellow stripe present in any specimens before me. This wide spread species was common around Manila. Mr. Reimschiissel found this frog rather difficult to collect because of its illusiveness.

### RANA VITTIGERA WIEGMANN

Wiegmann, Nova Acta Ac. Leop.-Carol., 1836, p. 225, pl. 21, fig. 1

| | | | |
|---|---|---|---|
| BYU 7944 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |
| BYU 7965-66 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |
| BYU 7973-75 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |
| BYU 7976 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |
| BYU 7979 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |
| BYU 7982-83 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |
| BYU 7985 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |
| BYU 7987 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |
| BYU 7989-93 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |
| BYU 8375 | Manila, Luzon | (E. Reimschiissel) | June, Aug., 1945 |

Many untagged immature specimens and tadpoles.

Remarks: The adults vary in length from 28 mm. to 78 mm. Specimen No. 7966 is 78 mm. in length; head length 28 mm. and head width 29 mm. The dorsal surface color is brownish with black spots to almost a black background, and with many parallel elongate ridges. Under surface white bordered with gray spots. This species was common around Manila during July and August, according to Mr. Reimschiissel. It was breeding in the drain ditches and water holes around the city. A carfeul study has been made of these specimens to determine if *R. moodiei* Taylor was among them. I am unable to find any specimens with "a flap of skin on the outer side of the fifth toe and metatarsal." a feature which is found in *moodici* but not in *R. vittigera*.

A further study of some of these specimens should be made in connection with Taylor's type which is in the Carnegie Museum at Pittsburg.

Mr. Reimschiissel collected more than a hundred immature specimens representing most of the developmental stages of this species. He reports that the adults were in the pools along with the larval forms when he collected them. An examination of the mouth structures of several of the tadpoles reveals the following: Papillae on the marginal third of the upper and all of the lower labia; teeth 2/3; beak horny and well developed; total body and tail length 30 mm.

### RANA LEYTENSIS BOETTGER

Boettger, Zool. Anz. 16, 1893, p. 365

BYU 7919-20 Tacloban, Leyte Island (E. Reimschiissel) March, 1945

Remarks: Two well preserved specimens with body lengths of 39 mm. and 31 mm. were taken near Tacloban in March, 1945.

### RHACOPHORUS LEUCOMYSTAX (KUHL)

(Kuhl), Gravenhorst, Deliciae Mus. Zool. Vratislav., Fasc. I, Lipsiae, 1829, p. 26

BYU 7922 Manila, Luzon (E. Reimschiissel) May, 1945
BYU 7981 Manila, Luzon (E. Reimschiissel) May, 1945
BYU 7996 Manila, Luzon (Wm. Weston) Oct., 1945

Remarks: Common throughout the Archipelago. Mr. Weston suspected that this species was breeding in October.

## Family Engystomidae

### KALOULA PICTA (BIBRON)

Bibron, in Eydoux and Souleyet, Voy. Bonite, Rept. pl. 9, fig. 2

BYU 7978 Manila, Luzon (E. Reimschiissel) July, 1945

Remarks: A distinctive species, head broad and short, body heavy set, legs short and spindly. This frog is common during the breeding season on the islands of Luzon, Negros and Mindoro.

### KALOPHRYNUS STELLATUS STEJNEGER

Stejneger, Proc. U. S. Nat. Mus. 33, 1908, p. 575

BYU 7910 South of Tacloban near Dulag, Leyte (E. Reimschiissel) Mar. 3, 1945
BYU 7912 South of Tacloban near Dulag, Leyte (E. Reimschiissel) Mar. 3, 1945
BYU 7916 South of Tacloban near Dulag, Leyte (E. Reimschiissel) Mar. 3, 1945

Remarks: There are three well preserved specimens, 35 mm. to 40 mm. in body length with a distinctly inverted V terminating in two black dots in the groin, in the collection. Common in the swampy forests of Mindanao. Taylor does not report this species as occurring in Leyte Island. Stejneger's specimen came from Basilan.

## LIZARDS

### Family Gekkonidae

#### HEMIDACTYLUS FRENATUS DUN. AND BIBR.

Dum. and Bibr. Erp. Gen. III, 1836, p. 366

| | | | |
|---|---|---|---|
| BYU 7363 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 7923-27 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 7950 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 7952 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 7954 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 7958-61 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 7963-64 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 7957-69 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 7971-72 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 7984 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |
| BYU 8376 | Manila, Luzon | (E. Reimschiissel) | June, 1945 |

Remarks: Mr. Reinschiissel's field notes indicate that this lizard is common in the houses and tents around Manila.

#### GECKO MUTILATA (WIEGMANN)

Wiegmann, Nova. Acta. Ac. Leop. Carol, XVII, 1836, p. 238

BYU 7962 Manila, Luzon (E. Reimschiissel) June, 1945

Remarks: This specimen was taken along with specimens of *H. frenatus*. It is widely distributed throughout the Philippine Islands.

#### GECKO GECKO (LINNAEUS)

Linnaeus, Syst. Nat. Ed. 10, 1, 1758, p. 205

BYU 8030 59th Station Hospital, Cebu Island (Doyle Taylor) Oct., 1945

Remarks: Mr. Taylor found it difficult to capture this specimen, but reports that the species is common around the hospital. The specimen has a body length of 85 mm., tail length of 94 mm., and 15 preanal pores.

### Family Agamidae

#### DRACO BIMACULATUS (GUNTHER)

Gunther, Rept. British India, 1864, p. 127

BYU 7915 Tacloban, Leyte Island (E. Reimschiissel) Mar. 10, 1945
BYU 9717 Tacloban, Leyte Island (E. Reimschiissel) Mar. 10, 1945

Remarks: According to Mr. Reimschiissel these lizards, *D. bimaculatus* and *D. spilopterus,* were difficult to capture. They would run up the trunks of coconut palms, and by keeping on the opposite side of the tree from the pursuer, were able to hide.

Flying lizards, belonging to the genus Draco, are found in Indo-China, the Philippine Islands, and the East Indian Archipelago. There are about forty species known, of which about a dozen are found in the Philippines. These lizards are not able to really fly, but only glide from one vantage point to another. A male and female are said by Smith, 1935, to stay together during the breeding season. The gular pouch of the male is a most interesting structure; during courtship it is greatly distended. The wings are extensions of the body walls supported by five or six patagial ribs. The tail is long and slender.

Specimen BYU 7915 has a total length of 95 mm.; the length from head to auns is 33 mm. The width of body and wings is 17 mm. The color is bluish with white mottling. Specimen BYU 7917 has a length of 50 mm. from head to anus. The tail is broken off from this specimen. Width of body and wings 36 mm. There are 9–10 lower labials and 9–9 upper labials.

### DRACO SPILOPTERUS (WIEGMANN)

Wiegmann, Nova Acata Ac. Caes.-Leop. I, 17, 1835, p. 216, pl. 15

BYU 7911 Tacloban, Leyte (E. Reimschiissel) Mar. 8, 1945
BYU 7916 Tacloban, Leyte (E. Reimschiissel) Mar. 8, 1945

Remarks: Two well preserved specimens are in the collection.

## Family Scincidae

### MABUYIA MULTIFASCIATA MULTIFASCIATA (KUHL)

Kuhl. Beitr. Zool. und Vergl. Anst. 1820, p. 126

BYU 7928-31 Manila, Luzon (E. Reimschiissel) May, 1945
BYU 7943 Manila, Luzon (E. Reimschiissel) May, 1945
BYU 7945-49 Manila, Luzon (E. Reimschiissel) May, 1945
BYU 7951 Manila, Luzon (E. Reimschiissel) May, 1945
BYU 7953 Manila, Luzon (E. Reimschiissel) May, 1945
BYU 7955-57 Manila, Luzon (E. Reimschiissel) May, 1945
BYU 7988 Manila, Luzon (E. Reimschiissel) May, 1945
BYU 7995 Manila, Luzon (E. Reimschiissel) May, 1945

Remarks: From Mr. Reimschiissel's field notes we learn that this species is common in the grassy semi-swampy areas around Manila. One specimen, No. 7946, has two well-developed tails.

### DASIA SMARAGDINUM (LESSON)

Lesson, Voy. Coquilla, Zool. 2, 1830, p. 43, pl. 3, fig. 1

| | | | |
|---|---|---|---|
| BYU 7909 | Tacloban, Leyte Island | (E. Reimschiissel) | March, 1945 |
| BYU 7913 | Tacloban, Leyte Island | (E. Reimschiissel) | March, 1945 |
| BYU 8004 | Tacloban, Leyte Island | (E. Reimschiissel) | March, 1945 |
| BYU 8006-07 | Cebu City, Cebu Island | (Doyle Taylor) | August, 1945 |

Remarks: The following is from E. Reimschiissel's field notes No. 187: "This lizard (No. BYU 7913) was taken on a coconut tree. It is very nimble and appears like those taken on the Admiralty Islands, but not so stocky. The forepart is green shading to a grey at the hind legs where a number of black dots appear on the legs and slides."

### LYGOSOMA JAGORII PALUSTRIS (TAYLOR)

Taylor, Philip. Jour. Sci. D 10, 1915, p. 102 (Sphenomorphus)

BYU 7914 Tacloban, Leyte Island (E. Reimschiissel) March, 9945

Remarks: A single specimen of Lygosoma (Hinulia) was collected at Tacloban. It was found on the ground; color brown with light cross bars over the back and anterior portion of the tail.

### BRACHYMELES SP.

BYU 9577 Tacloban, Leyte Island (E. Reimschiissel) March, 1945

Remarks: A single specimen of this species collected by Mr. Reimschiissel is now in the collection. A portion of the tail has been broken off and lost, the body has been flattened by being run over by a vehicle. The head, legs, and body scales are well preserved. In the Taylor key, 1922, p. 245, this specimen runs to *B. burski* or *B. bonitae*. It differs from both of these species as follows: Twenty-two scale rows; front legs 20 times in body length between front and hind legs; upper labials 6; lower labials 6; 22 teeth on the left lower jaw; mental broader than high and in contact with the first lower labial and first chin scale; fronto-basal in contact with the rostral, supranasal, postnasal, prefrontal, and frontal; rostral broad and clearly seen from above; four supraoculars; second to fourth in contact with the marginal quadrant of the frontal; legs stump-like with three fairly transparent short diget-like projections.

This genus of scincid lizards, consisting of ten known species is confined to the Philippine Islands. I can find no reference to species of this genus having been collected on Leyte Island. Additional well preserved specimens from this area would be of interest in a future study of this endemic Philippine genus.

## SNAKES

### Family Typholopidae

#### TYPHLOPS BRAMINUS (DAUDIN)

Daudin, Hist. Rept. VII, 1803, p. 279

BYU 7980 Manila, Luzon (E. Reimschiissel) July, 1945

Remarks: This specimen was reported in my previous paper.[3]

### Family Colubridae

#### ACROCHORDUS GRANULATUS (SCHNEIDER)

Hist. Amph. 1, (1799), p. 243. *Hydrus*

BYU 7997 Manila, Luzon (Herbert Frost) June, 1945
BYU 7998 Manila, Luzon (Herbert Frost) June, 1945

Remarks: This harmless snake lives in the sea and fresh water. The narrow head, small eyes, and one hundred or more body scales make it rather distinctive. It feeds on small fish. Smith, 1943, does not consider Chersydrus as distinct from Acrochordus.

#### LYCODON AULICUS (LINN.)

Linnaeus, Mus. Ad. Frid. I, 1754, p. 29, pl. III, fig. 2

BYU 7942 Manila (E. Reimschiissel) July, 1945
BYU 7977 Manila (E. Reimschiissel) July, 1945
BYU 8000 Los Banos, Luzon (Herbert Frost) July, 1945
BYU 8001 Los Banos, Luzon (Herbert Frost) July, 1945
BYU 8005 Cebu City, Cebu Island (Doyle Taylor) August, 1945
BYU 8099 Margeritta, Assam, India (James Bee) April 18, 1945

Remarks: This nocturnal egg-laying colubrid is widely distributed through the Malayan area. Around Manila it is common. Specimen BYU 7977 has 17 rows of body scales; also BYU 7942 has 17 rows of scales, 62 urosteges and a divided anal.

#### NATRIX SPILOGASTER (BOIE)

Boie, Isis, 1827, p. 535

BYU 7940 Manila (E. Reimschiissel) June 5, 1945
BYU 7941 Manila (E. Reimschiissel) June 5, 1945
BYU 7999 Manila (Herbert Frost) October, 1945

Remarks: Mr. Frost informed me that this snake was common around Manila and Los Banos. Mr. Reimschiissel reports in his field

(3) Op. Cit.

notes that the specimens he collected were grey in color with two tan lines running lengthwise with the body. He also reports that the specimen No. 7940 bit a frog, killing it within a few minutes. All these specimens are well preserved.

ELAPHE ERYTHRURA (DUMERIL AND BIBRON

Dumeril and Bibron, Erp. Gen. 7, 1854, p. 175

BYU 7994 Manila (Wm. Weston) October, 1945
BYU 8002 Cebu City, Cebu Island (Doyle Taylor) October, 1945
BYU 8008 Cebu City, Cebu Island (Doyle Taylor) October, 1945

Remarks: Three well preserved specimens. The Manila specimen No. 7994 is 1221 mm. in total length.

CALAMARIA GERVAISII GERVAISII (DUMERIL AND BIBRON)

Dumeril and Bibron, Erp. Gen. 7, 1854, p. 76

BYU 7986 Manila (E. Reimschiissel) August 19, 1945

Remarks: One small well preserved specimen. Color and marking agree well with Taylor's description, 1922, p. 187.

CHRYSOPELEA ORNATA (SHAW)

Shaw, Zool. 3, 1802, p. 477

BYU 7918 Leyte Island (E. Reimschiissel) March, 1945

Remarks: This specimen was damaged some when it was killed, since it was thought to be poisonous. Color of ventral scales is deep blue-black. Total length 750 mm., tail slender and pointed.

Family ELAPHIDAE

NAJA NAJA SAMARENSIS (PETERS)

Peters, Mon. Berl, Ak., 1861, p. 690

BYU 7902 Near Tacloban, Leyte Island (E. Remschiissel) March 8, 1945

Remarks: Mr. Reimschiissel recovered this specimen which had been killed by several of the Army boys when they found it in a "foxhole." The head had been cut off, but neither it or the body were damaged. The specimen has a length of thirty-two inches; the back is black and the venter yellow. The specimen is fat, it had eaten four mice which were removed when it was killed. This snake is greatly feared by the native Filipinos.

ACKNOWLEDGMENTS

I am pleased to acknowledge the help of Dr. Edward H. Taylor of the University of Kansas, who spent several years in the Philippine Islands making a study of the herpetology of this area, for his aid in determinations of several of the species and for the loan of valuable literature. Dr. Wilmer W. Tanner also helped in making some determinations for which he is deserving of thanks. Thanks must again be extended to the several collectors of the specimens reported in this paper. Collections from the Pacific Islands would have been greatly improved if more men had put forth effort in this endeavor.

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# REDISCOVERY OF THE GENUS PSEUDOGEKKO WITH DESCRIPTION OF A NEW SPECIES FROM THE SOLOMON ISLANDS

WALTER C. BROWN[1] and VASCO M. TANNER[2]

Taylor (1915, p. 96) described *Luperosaurus compresicorpus* on the basis of a single female specimen from Batan Province, Luzon Island in the Philippines, noting at the time that he was not sure of its generic position. Later (1922, p. 103), he made this species the type of the genus *Pseudogekko* and suggested a possible relationship with *Thecadactylus*. The genus is very distinct and we are also somewhat in doubt as to its true affinities. However, comparison of this single specimen from the Solomon Islands with a paratype of *Luperosaurus macgregori* and the description of the genera *Thecadactylus* and *Pseudothecadactylus* based on Brongersma's detailed consideration of their differences (1934, pp. 176-179, and 1936, p. 136) we are inclined to believe that it is probably more closely related to the genus *Luperosaurus*.

The type of *Pseudogekko compresicorpus* was deposited in the collections of the Philippine Bureau of Science, No. 1781, (Taylor, 1944, p. 148). This and probably two embryos mentioned by Taylor 1922, p. 105) are to the best of our knowledge no longer extant due to the loss of the collections of the Philippine Bureau of Science during the second World War; and these were, as far as we were able to find in the literature, the only known specimens of the genus.

Our assigning of the present species to this genus is based on general similarities which are much greater than the aparent differences in the nature of the claw sheath as shown in Taylor's drawing (fig. 12 c, 1922, p. 104) and our own figure 1 which follows. Taylor's drawing suggests that the ventral portion of the claw sheath is formed by the two halves of the terminal lamella. In the present species as well as in *Luperosaurus macgregori* the ventral portion of the claw sheath is a pointed median plate which is frequently indistinguishable from the claw except in a lateral view. We venture that the same ventral sheath structure was present in the specimen of *P. compresicorpus* but passed unobserved. The fact that the terminal lamella in the present species is actually undivided is paralleled by the conditions in *Lepido-*

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*dactylus,* being divided in some species., as *L. lugubris* for example, and undivided in others, as *L. guppyi.*

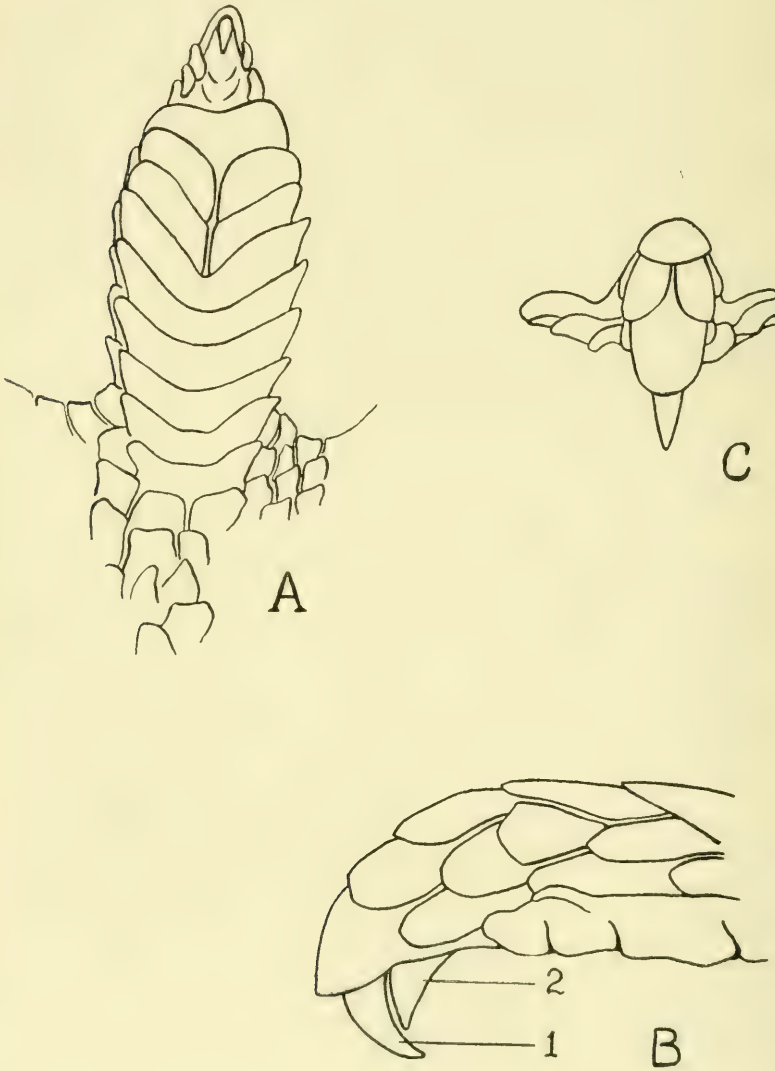


Fig. 1. Inferior view of second toe of *Pseudogekko shebae* (A); lateral view of toe (B), 1. Claw, 2. inferior portion of claw sheath; end view of toe (C).

**Pseudogekko shebae** Brown and Tanner, new species

Holotype: Brigham Young University No. 7002, collected in the lower Lunga River area on Guadalcanal Island, May 31, 1944, by John Chattin and presented at that time to D. Elden Beck who later deposited the specimen in the herpetological collections at Brigham Young University.

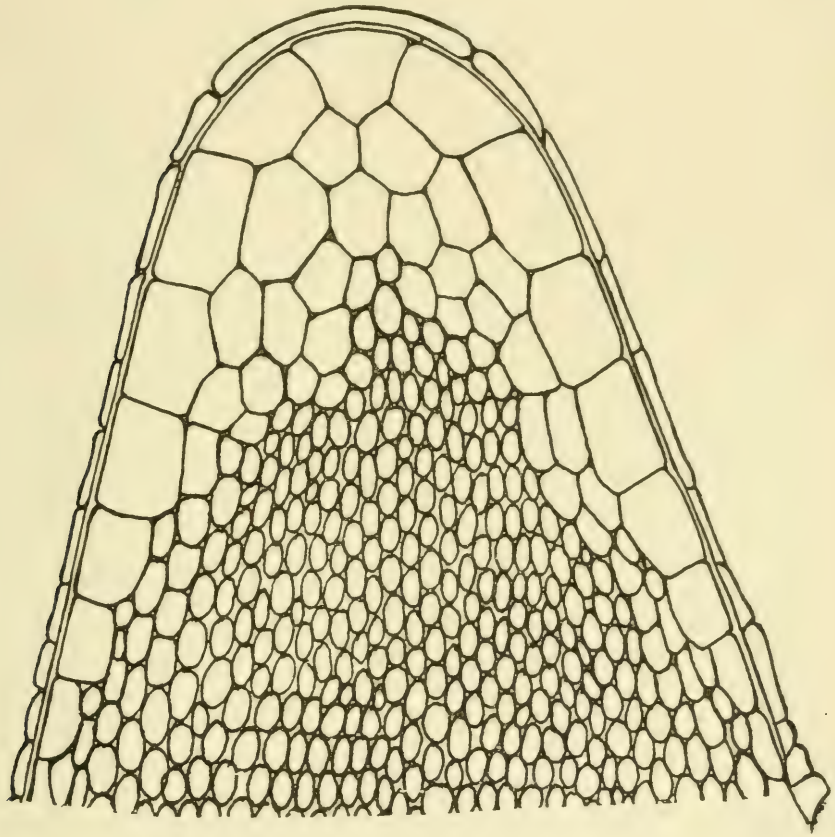

Fig. 2. Ventral view of head of *Pseudogekko shebae*.

Definition: A *Pseudogekko* differing primarily from *P. compresicorpus* in the much lower number of labials (10 upper, as compared to 19 or 20 in *P. compresicorpus;* and 9 lower, as compared to 16), the presence of enlarged chin shields, and the undivided condition of the terminal lamella.

Description of Holotype: Body very slender; head about 1½

times as long as broad and more broad than the body; snout slightly longer than the distance from the eye to the ear; eye large with vertical pupil; ear small, oval; upper labials 10/10, lower labials 9/9; rostral more than twice as broad as long with a broadly rounded median notch dorsally; nostril between the rostral, the first labial and three supranasals; the anterior supranasals separated from each other by three large, flat granules, the median one much the largest and resting in the broad depression in the rostral; mental somewhat pentagonal, only slightly longer than the first lower labials; two rows of chin shields followed by two rows of slightly enlarged scales (fig. 2).

Dorsum covered with small granules, those of the snout largest; laterally merging into the larger, moderately imbricate scales of the venter and the limbs; those of the venter tending to be hexagonal on the posterior part of the body (The fact that they are imbricate can best be observed when viewed laterally.); the ventral scale rows falling in 16 longitudinal rows between the angles of the hindlimbs; tail round, slender, covered with squarish imbricated scales as in *Bavayia;* 30 preanal and femoral pores in a continuous series, followed by the enlarged preanal scales; postanal slits and ossicles present.

Limbs moderately developed; the digits long, rather uniformly dilated except for the most distal part which tapers gradually to the compressed claw sheath which encloses the terminal, recurved, retractile claw (fig. 1); inner finger and inner toe clawless (This unique specimen has lost the claws from all but three of the toes but they remain on the fingers.); lamellae beneath the fingers and toes moderately broad and wide with only the 2 or 3 adjacent to the terminal one divided, 11 beneath the fourth toe; fingers and toes 1/4 to 1/3 webbed.

Color: Dorsum (in preservative) reddish-brown (almost "chestnut," Maerz and Paul, 1930, pp. 36-37), mottled with light blotches on the lower lateral surfaces; margin of the lips yellowish tan; a narrow broken dark brown line from beneath the eye to the region of the neck posterior to the ear; a series of 3 or 4 small dark brown blotches between the limbs (more distinct on the left side), and a dorsolateral series of three small dark brown blotches on either side extending from the neck to a point about 1/4 of the distance between the axilla and the groin; the tail marked by 4 somewhat indistinct lighter transverse bands on the dorsal surface.

Measurements (in millimeters): Length of head and body 36, length of head (to posterior edge of tympanum) 9, breadth of head 6, snout 3½, diameter of eye 2.75, eye to ear 3, length of forlimb 9+, length of hind limb 12+, length of tail 29. (The measurements of the

limbs are given as + figures because of the difficulty of straightening them completely without doing damage.)

Acknowledgments: Drawings were made by Miss Jean Allred of Stanford University and Mr. Kent Christensen of Brigham Young University.

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# AMPHIBIANS AND REPTILES CONTRIBUTED TO BRIGHAM YOUNG UNIVERSITY BY OWEN BRYANT[1]

VASCO M. TANNER
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Brigham Young University

Mr. Owen Bryant, a very careful and successful collector and student of insects, especially Coleoptera, also collects Amphibians and Reptiles when they are handy. For many years I have enjoyed corresponding and carrying on an exchange of Coleoptera with Mr. Bryant and his interesting and companionable wife, Mrs. Bryant. Recently Mr. Bryant contributed the following Amphibian and Reptiles to the Brigham Young University Herpetological collection. Since many of the specimens come from localities which are new to the collection, I am pleased to make this brief report.

## AMPHIBIANS

### Family Ambystomidae

*Ambystoma tigrinum nebulosum* Hallowell

BYU 8930. Gore Pass, Colorado. IX-13, 1948

Mr. Bryant collected this larval specimen at an elevation of 8000 feet.

### Family Plethodontidae

*Ensatina eschscholtzii xanthoptica* Stebbins

BYU 9091. La Honda, California. V-20, 1949

One young specimen 41 mm. long. Stebbins' study of this genus, 1949 indicates that there may be some intergradation between *oregoninsis* and *xanthoptica* in this area.

*Batrachoseps attenuatus attenuatus* (Esch.)

BYU 9092 - 94. La Honda, California. V-20, 1949
BYU 9087 - 90. Moss Beach, California. V-1, 1949

### Family Scaphiopodidae

*Scaphiopus hammondii hammondii* Baird

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1 Contribution No. 118 from the Department of Zoology and Entomology.

BYU 8932. Chiricahua Mts., Arizona. VI-22, 1933

This specimen agrees with *S. h. hammondi* specimens from southern California with which I have compared it. Mr. Bryant collected it at an elevation of 8000 feet.

### Family Hylidae

*Hyla arenicolor* Cope

BYU 9077-79. Mt. Lemmon, Catalina Mts., Arizona. VI-21, 1933
BYU 9097. Mt. Lemmon, Catalina Mts., Arizona. VI-21, 1937

This species was common on June 15, 1933 when Mr. and Mrs. Bryant collected the above specimens.

### Family Ranidae

*Rana sylvatica cantabrigensis* Baird

BYU 8924. Dawson, Yukon Province, Canada. VI-5, 1946
BYU 9161. Circle, Alaska. VI-10, 1946

Wright and Wright consider specimens from Alaska, and southeast through Canada to the Great Lakes to be *R. s. cantabrigensis*. These are new locality records of this species for the B. Y. U. collection. Mr. Bryant collected them along the Yukon River on June 5 and June 10, 1946.

## REPTILES

### Family Iguanidae

*Anolis carolinensis* Viogt

BYU 8931. New Orleans, Louisiana. X-22, 1948

Our specimen taken October 22, 1948 by Mr. and Mrs. Bryant.

*Sceloporus scalaris slevini* Smith

BYU 9096. Santa Rita Mts., Arizona. XI, 1936

*Sceloporus graciosus graciosus* (B. & G.)

BYU 8929. Sunbeam, Colorado. V-4, 1944
BYU 8925. Old Faithful, Yellowstone Park, Wyo. VII-19, 1947

*Sceloporus undulatus undulatus* (Latr.)

BYU 8927-28. Jackson, Mississippi. X-24, 1948

Specimen No. 8927 is well colored on the neck, belly, and back.

*Sceloporus undulatus hyacinthinus* Green

BYU 8926. Leslie, Arkansas. X-29, 1948

*Urosaurus ornatus linearis* Baird

BYU 9081. Santa Rita Mts., Arizona. IX-30, 1936
BYU 9095. Santa Rita Mts., Arizona. XI, 1936

Mr. Bryant collected specimen BYU 9081 at the old Parker Ranch.

Family Teiidae

*Cnemidophorus sexlineatus perplexus* (B. & G.)

BYU 9080. Santa Rita Mts., Arizona. X-20, 1936

## FISHES

Family Gasterosteidae
Stickleback Fish

*Pungitius pungitius* (Linn.)

BYU 8933-34. Aklavik, Northwest Territories, Canada

Mr. Bryant collected these fishes which were stranded in shoals, along with a species of white fish, on September 25, 1931. Aklavik is on a small tributary of the Mackenzie River which empties into Mackenzie Bay, Arctic Ocean. Specimen BYU 8933 has 10 dorsal spines and is 42 mm. in length, while BYU 8934 has only 9 dorsal spines and is 46. mm. in length.

# NOTES ON THE NUMBER, LENGTH, AND WEIGHT OF YOUNG GARTER SNAKES

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Brigham Young University

Since so little is known about the number, length and weight of young garter snakes the following information concerning the broods of *Thamnophis sirtalis parietalis* Say and *Thamnophis ordinoides vagrans* B. & G. is recorded at this time. For the past seven years broods of the two species have been observed both in the field and the laboratory. On August 5, 1945, three broods of *T. o. vagrans* were observed in the field, near the pond on the B. Y. University campus. Each female had several young with her, but I was unable to accurately count the number of young in each case. The females moved off into the grass when disturbed while the young followed after. One female stopped, coiled up a little, and four of the young ran into the coil. Again on August 3, 1946, I accidentally ran on to a brood of *T. s. parietalis* near the mill race, just north of the Provo City power plant. I was unable to determine the number of young since the female moved into the grass and water and was soon lost.

While returning from a Gull banding trip to Rock Island in Utah Lake on July 8, 1944, three gravid females of *T. s. parietalis* were collected by Wilmer W. Tanner and the writer in the swamps west of Palmyra on the south shore of Utah Lake. These were placed in separate breeding cages and supplied with fresh water. Each day they were observed. On the morning of August 2, two of the females had given birth to broods of 16 and 10 young snakes, while the third one produced five young and two unhatched eggs on August 7th. The largest brood of 16 young was designated as No. 1 and the other broods as No. 2 and No. 3. It will be noted that some specimens in broods No. 1 and 2 were kept in the cages for several days to see if they would feed on insects, and if they increased in length and weight.

Three boys hunting snake skins for belts captured a female *T. o. vagrans* on the B. Y. U. Campus along the canal near the stadium on July 29, 1944. When they began to skin the specimen, young snakes issued from the posterior abdominal incession. The boys brought the female and young snakes to me, explaining that they were surprised to find that this snake had eaten so many young ones. When the boys arrived with the snake, ten young live specimens were free while six live ones were soon liberated making a total of 16 live specimens; six embryos were observed which were not completely developed. This brood thus would have consisted of 22 individuals. The 16 live specimens were measured and weighed. The young, no doubt, would have been born during the early part of August.

In June 1949, a female *T. o. vagrans* was placed in a breeding cage in the laboratory for observation. On August 8th at 9 a.m. I observed that she had a brood of young. These were born Saturday or Sunday, August 6th or 7th since there were no young snakes on Friday, August 5th. Young snakes of both species were observed to molt on the second or third day after birth.

In the tables below the length and weight of species of each brood is recorded. The length is recorded in millimeters and the weight in grams.

(1) Contribution No. 120, Department of Zoology and Entomology.

The Young of *Thamnophis sirtalis parietalis*

Brood No. 1 August 2, 1944

| Specimen No. | Length | Weight | Remarks |
|---|---|---|---|
| 1 | 170 | 1.6 | Specimen injured; measured and weighed Aug. 2. |
| 2 | 223 | 2.3 | Measured, weighed and preserved Aug. 6. |
| 3 | 232 | 2.5 | Digestive tract found to contain sand grains. Preserved Aug. 6. |
| 4 | 230 | 2.5 | Weighed, measured and preserved Aug. 6. |
| 5 | 234 | 2.5 | " " " " " " |
| 6 | 223 | 2.3 | " " " " " " |
| 7 | 246 | 2.7 | Measured, weighed and preserved Aug. 14. |
| 8 | 238 | 2.6 | " " " " " " |
| 9 | 230 | 2.3 | " " " " " " |
| 10 | 245 | 2.4 | " " " " " " |
| 11 | 224 | 2.4 | Following four sepcimens studied Aug. 25; they had been supplied with insepcts and fresh water since August 14. |
| 12 | 228 | 2.2 | |
| 13 | 228 | 2.3 | |
| 14 | 233 | 2.3 | |
| 15 | 230 | 2.3 | The following two specimens were measured and preserved September 14. They had been |
| 16 | 194 | 2.1 | kept in a breeding cage with water and insects since August 14. |

The Young of *Thamnophis sirtalis parietalis*

Brood No. 2 August 2, 1944

| | | | |
|---|---|---|---|
| 1 | 200 | 2.4 | Measured, weighed and preserved Aug. 6. |
| 2 | 225 | 2.7 | Microscopic study revealed sand grains in digestive tract. Preserved Aug. 6. |
| 3 | 197 | 2.4 | Measured, weighed and preserved Aug. 6. |
| 4 | 230 | 2.7 | Digestive tract revealed sand grains plus moulted scales which had been eaten. Preserved Aug. 6. |

| Specimen No. | Length | Weight | Remarks |
|---|---|---|---|
| 5 | 220 | 2.8 | Measured, weighed and preserved Aug. 6. |
| 6 | 230 | 2.7 | Measured, weighed and preserved Aug. 14. |
| 7 | 220 | 2.4 | " " " " " " |
| 8 | 230 | 2.5 | Measured, weighed and preserved Aug. 25. |
| 9 | 222 | 2.3 | " " " " " " |
| 10 | 220 | 1.8 | " " " " " " |

The Young of *Thamnophis sirtalis parientalis*

Brood No. 3 August 7, 1944

| | | | |
|---|---|---|---|
| 1 | 225 | 2.3 | This is one of the dead specimens. Measured and preserved Aug. 7, 1944. |
| 2 | 184 | 2.2 | This also is one of the dead specimens. Measured and preserved Aug. 7, 1944. |
| 3 | 230 | 2.5 | Measured and preserved Aug. 7, 1944. |
| 4 | 216 | 2.3 | " " " " " " |
| 5 | 225 | 2.3 | " " " " " " |

The Young of *Thamnophis ordinoides vagrans* (July 29, 1944)

| | | | |
|---|---|---|---|
| 1 | 179 | 1.7 | The 16 specimens were measured, weighed and preserved July 29, 1944. |
| 2 | 191 | 2.2 | |
| 3 | 190 | 2.4 | |
| 4 | 183 | 2.1 | |
| 5 | 192 | 2.4 | |
| 6 | 183 | 2.0 | |
| 7 | 184 | 2.1 | |
| 8 | 186 | 2.2 | |
| 9 | 179 | 1.7 | |
| 10 | 186 | 2.2 | |
| 11 | 176 | 2.2 | |
| 12 | 167 | 1.4 | |

| Specimen No. | Length | Weight | Remarks |
|---|---|---|---|
| 13 | 187 | 2.3 | |
| 14 | 187 | 2.1 | |
| 15 | 187 | 2.2 | |
| 16 | 181 | 1.9 | |

The Young of *Thamnophis sirtalis parietalis*

| | | | |
|---|---|---|---|
| 1 | 240 | 3.2 | Measured, weighed and preserved Aug. 8. |
| 2 | 220 | 2.5 | " " " " " " |
| 3 | 222 | 2.6 | " " " " " " |
| 4 | 220 | 2.8 | " " " " " " |
| 5 | 210 | 2.8 | Measured, weighed and preserved Aug. 8. |
| 6 | 227 | 2.1 | " " " " " " |
| 7 | 217 | 2.1 | Measured, weighed and preserved Aug. 10. |
| 8 | 223 | 2.6 | " " " " " " |
| 9 | 232 | 2.7 | " " " " " " |
| 10 | 242 | 2.9 | " " " " " " |
| 11 | 226 | 2.6 | Measured, weighed and preserved Aug. 11. |
| 12 | 230 | 2.5 | " " " " " 12. |
| 13 | 230 | 2.4 | " " " " " 16 |

From the above data and observations of broods of *T. s. parietails* and *T. o. vagrans,* in the vicinity of Provo, Utah, young are produced in early August of each year. The broods consist of 5 to 22 specimens, which range in length from 167 to 240 mm. and weigh 1.4 to 3.2 grams each. The red-sided garter snake young seem to be a little longer and weigh more than the wandering garter snakes. Nothing was found out about the food of the young snakes.

# REPTILES COLLECTED IN THE VICINITY OF LAS VEGAS, NEW MEXICO

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While engaged in a study of amphibia in the region of Las Vegas, San Miguel County, New Mexico in the summer of 1940 (Bragg, 1941), the senior author made collections of reptiles as opportunity afforded. The following annotated list summarizes the field notes of the senior author. The determinations, unless otherwise listed, have been made by the junior author. The specimens have been placed in the University of Oklahoma Museum, Division of Zoology, and the numbers quoted are from that collection (UOMZ).

*Terrapene ornata* (Agassiz). This animal occurs sparingly in the short-grass area about Las Vegas. Only two specimens were seen; but on a trip south in late August, they became quite abundant on the road (highway 85) just south of the Pecos River, not far from Dilia, and continued to be plentiful as far south and east as Tucumcari.

It is of interest that this species is the only turtle which could be found at Las Vegas and the local residents knew of no other.

UOMZ 25170 from Las Vegas has been retained.

*Thamnophis radix haydenii.* This garter snake is extremely abundant about all permanent water and the larger temporary pools and ditches in the vicinity of Las Vegas. In such situations it feeds upon frogs and metamorphosing tadpoles. None were seen in the higher reaches of the valley of Gallinas Creek, but from Montezuma southward through Las Vegas, several specimens could be secured within a half hour along the stream by day or by night. It was also common about seepage pools and irrigation ditches on the high short-grass mesas and it entered the Transition Zone in the pinyon-juniper association along the valleys of streams.

Specimens from Las Vegas are numbered 25224-7.

*Thamnophis elegans vagrans* (Baird and Girard). One specimen (25201) was brought in by a student who collected it at El Porvenir, a small settlement on a branch of Gallinas Creek at about 8,000 feet altitude, some 15 miles north of Las Vegas. Nos. 25206 and 25231 were taken at Las Vegas.

*Diadophis punctatus arnyi* (Kennicott). Two specimens (25203-4) of this ring-neck snake were presented by a local resident who had

collected them from under a rock in Box Canyon, seven miles south of Las Vegas. The species may be quite rare here since this record is apparently the first for the state and represents a substantial range extension from the nearest reported locality, Trinidad, Las Animas County, Colorado (Blanchard, 1942). The specimens are too badly shriveled to facilitate accurate scale counts.

*Crotalus v. viridis* Rafinesque. Rattlesnakes are rare in the vicinity of Las Vegas as well as in the mountains to the north. None were taken alive. A single mutilated specimen (24967) was secured atop the mesa at the Las Vegas airport in August. The attendant mentioned that he had seen four other rattlers which had been killed near this same location during the past year.

*Gambelia w. wislizenii* (Baird and Girard). As might be expected from its type locality at Santa Fe, New Mexico, the leopard lizard occurs about Las Vegas. It seems, here as elsewhere, limited to areas of large rocks. It is not so numerous at the other lizards found, only two individuals having been seen during the summer. One of these was handled and examined closely while alive, but no specimens were secured for preservation.

*Holbrookia m. maculata* X *approximans*. Intergrades are to be expected in this region and the two specimens taken (25248, 25251), both from Las Vegas, are inadequate to allow a thorough analysis of the population. Other specimens were noted but at first were confused with *Sceloporus* and, therefore, no exact data on the local distribution and abundance are available.

*Sceloporus g. graciosus* Baird and Girard. As suggested by Smith (1946, p. 251) the range of this species may be more extensive than is known. A single specimen (25656) from Las Vegas extends the range somewhat southeastward.

*Sceloporus undulatus tristichus* Cope. This subspecies was very abundant both at Las Vegas and at Montezuma, 7 miles northwest of Las Vegas. It inhabits the plains and mesas as well as the wooded hillsides. It seemed to be more abundant than the horned lizard in the Transition Zone but the latter far outnumbered it on the plains.

Nos. 25250, 25657-8 are retained.

*Phrynosoma cornutum* (Harlan). This horned lizard was not found at Las Vegas and it is very doubtful if it occurs there. Two specimens were brought, however, from Clayton, Union County, about 130 miles to the northeast, where it was declared by its collector to be quite common.

*Phrynosoma douglassii hernandesi* (Girard). This is the most

abundant reptile (or at least the most frequently encountered) in the immediate vicinity of Las Vegas and it is quite common in the mountains for at least 40 miles to the north and west. Hundreds of specimens could have been secured for they were seen practically every day throughout the summer. They were most abundant in weedy vegetation along the banks of streams but they were also collected or seen high on the hillside among the pines *(Pinus ponderosa)* and scrub oak *(Quercus undulata)* and on the short-grass mesas north and east of the city. Young ones become very abundant in late July and early August. This suggests that in this species hatching or birth occurs in mid-summer.

A constant variation in color was noted between specimens of the short-grass area and of the wooded hillsides. The former were consistently much lighter than the latter; and the darker individuals did not change noticeably when kept in captivity for several days. The color distinction may be indicative of the impending intergradation with *P. d. ornatissimum.*

Specimens retained are from Mora County, near Mora (25207); San Miguel County, Las Vegas (25205, 25208-14); and Taos County, near Taos (25215). The specimen from Taos is poorly preserved but it measures 108 mm. snout to vent and 145 mm. overall. These figures are in excess of the maximum size reported by Smith (1946, p. 304-5).

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# HERPETOLOGICAL NOTES FROM MALHEUR COUNTY, OREGON

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Published herpetological records from extreme southeastern Oregon are few, probably due largely to the relative inaccessibility of much of this area. During the period from June 7, to June 15, 1919, a small group from the Oregon State College Museum of Natural History visited Malheur County with a view toward studying the land vertebrates of the area.

Two localities were chosen for study. The first extended from the Owyhee Reservoir, at the mouth of Leslie Canyon, to about seven miles up said canyon and four miles up Runaway Canyon, the two canyons joining five miles from the reservoir. Camp was made just below this junction in R. 45E. T. 25S., Sec. 5. Huge lava outcrops, rich in red and yellow colors, predominate the terrain. The country is very precipitous, and is either sparsely covered with small sagebrush or barren, exposing light green or gray colored rocks. A few junipers find a foothold here and there. Between the hills are canyons, floored by narrow to quarter-mile-wide flats on which the sagebrush may grow to six or seven, and occasionally ten feet tall. Most of the canyons are dry, although a very few small springs run permanently. During the day, the run-off from these springs rarely flows for more than a few hundred yards before disappearing. At night, these streams flow much farther.

The second area was in the vicinity of the junction of the three forks of the Owyhee River (R. 45E., T. 34S., Sec. 35). These rivers flow in relatively deep, steep canyons. The terrain is basically the same as in the first area, but greater water supply enables a better development of the riparian vegetation. The river and small stream vegetation is predominated by willows, a few scattered alders, and a luxuriant grass cover extending as far as one hundred feet from the streams. Above the rivers are rolling plateaus with little vegetation other than small sagebrush. Limited areas are sparsely to densely covered with small to large rocks, up to four feet in diameter.

The predominant types of soils encountered were either relatively hard packed or rocky. An almost complete lack of sandy or loose gravelly soil may account for the absence of certain records in the two localities.

## LIST OF SPECIES

1. *Bufo b. boreas* (Baird and Girard).—Five males and two females were taken in a short grass-forb covered flat, bordering the Owyhee Reservoir at the mouth of Leslie Canyon. Another specimen was observed in a similar vegetation situation, this vegetation being maintained by a spring of drinkable water about five miles up Leslie Canyon from the reservoir. No toads were encountered at the second locality.

2. *Bufo w. woodhousii* Girard.—One male was taken from under a boat at the edge of Owyhee Reservoir at the mouth of Leslie Canyon. The calling of a second male caused it to be captured in the shallow edge of the reservoir. One female was taken after a light rain on the blacktop road between Nyssa and Adrian some fifty feet from the point where the highway crosses the Owyhee River. This specimen was collected at about 12:00 midnight.

3. *Hyla regilla* Baird and Girard.—Only one male was heard and collected at the first locality, following a light rain. The time of collection was about 9:00 P.M. The animal was found on damp gravelly soil next to dense herbaceous vegetation. This vegetation was supported by the runoff of a spring some seventy feet away. One male and two females were collected in the Three Forks area and many more were heard.

The only anuran larvae encountered belonged to this species. Many *Hyla* tadpoles were present in overflow pools in the second locality, these varying in size from about 20 mm. with no limbs apparent to specimens with all four limbs well developed.

4. *Uta s. stansburiana* (Baird and Girard).—Five males and two females were taken from the Owyhee Reservoir area. This form appeared to thrive in three niches around the reservoir. The first consisted of small gravel, somewhat flattened and about the consistency of pea gravel, scattered sagebrush, and relatively small rocks about four or five inches long. The lizards sunned on the gravel and rocks, but took refuge in the sagebrush when disturbed. The second habitat was very rocky, with rocks varying from three inches to four feet in diameter. The substrate was much the same as the fine material in the first habitat, but was not as deep nor as loose. No vegetation was observed. Here they sunned on the rocks but took refuge under the rocks. The third habitat was along the edge of the reservoir, and consisted of a boulder beach with little or no vegetation. It is hard to differentiate a preference between the first and second habitat, but both

were definitely preferred to the third. Here, a total of eight lizards was seen in the space of about one acre.

Three specimens of this species were seen on large rocks among the sagebrush in upper Leslie Canyon.

One pair was observed in what was probably a copulatory position. The male was gripping the female just in front of the hind legs, and was not gripping her head in his mouth. Since these two were easily disturbed, copulation had probably not begun. One female captured contained three 11 mm. eggs, and the other contained four 6 mm. eggs.

5. *Sceloporus g. graciosus* (Baird and Girard).—Two males and one female were taken on rocky islands surrounded by sagebrush. These rocky islands appear to be the result of moderate erosion during the spring run-off. These areas were located on the sagebrush plateau above the Three Fork canyon system. The female contained seven 13 mm. eggs, four of which she deposited after being mortally wounded with dust shot. Other specimens were seen but were too swift for capture.

6. *Sceloporus occidentalis biseriatus* (Hollowell).—A total of nine males and eleven females was taken from both areas. Apparently these lizards are quite strict in their choice of a rocky habitat, where they spend a great deal of time sunning themselves. Only one specimen was found away from the rocks, this animal being observed in the car headlights at about 9:30 P.M. This swift was at least one hundred feet from its typical rocky habitat.

Though wary, these fence lizards seemed quite curious and were not particularly alarmed when approached. When capture was attempted, the swifts would try to run under the rocks they were on. Some of these rocks were over fifteen feet high. The lizards usually took refuge from the sun by 10:00 A.M., but a few individuals were observed and some taken around 12:00 noon, when the ground temperature was close to 120° F.

Six of the females had near mature eggs and two had recently ovulated. Of those having eggs, two had eight, one had ten, one had eleven, and two had thirteen. The eggs ranged in size from 12 to 15 mm.

7. *Coluber constrictor mormon* (Baird and Girard).—One male and one female with three 32 mm. eggs were taken from the Three Forks collecting site. The female was taken on an open gravelly slope with scattered sage and sparse grass cover and the male was taken in a grassy meadow. At least two others were seen in grassy situations.

8. *Pituophis catenifer deserticola* Stejneger.—Two males and one female were taken from the Owyhee Reservoir locality. One male was collected on a sandy area at the edge of a sage flat, just below a small brushy canyon. The other male and the female were collected on a dirt road in Leslie Canyon at about 10:00 P.M. A second female was collected in an open grassy meadow near the middle fork of the Owyhee River. Both males had extremely dark markings, in contrast to the lighter markings of the females.

9. *Thamnophis ordinoides vagrans* (Baird and Girard).—Four males and four females were taken from the Three Forks area. Two females contained developing embryos, one contained no eggs and the other contained eggs showing no apparent embryonic growth. All snakes of this species were collected in riparian vegetation along streams or in the streams. Three of these snakes were collected while feeding on *Hyla* tadpoles in shallow overflow pools. An 800 mm. female collected in a shaded area near a stream disgorged a six-inch cyprinid when picked up.

10. *Hypsiglena ochrorhyncha* Cope.—A single specimen, 208 mm. in length, was found dead on the dirt road passing through Runaway Canyon. The canyon at this point is a comparatively narrow gorge. The canyon floor, adjacent to the road, is a jumbled accumulation of basaltic fragments from the cliffs above. This appears to be the first record for southeastern Oregon. Anderson (1940) published the first Oregon record from Umatilla Butte, three or four miles north of Hermiston, Umatilla County, Oregon. He collected two specimens from small burrows under rocks.

11. *Crotalus viridis lutosus* (Klauber).—Two males, one female and one immature were taken. One other rattlesnake was shot, but was not suitable for a specimen. An adult male found at the top of Runaway Canyon was in the shade formed by two large rocks that gradually came together and apparently formed a den farther back. A male and a female were collected under a flat rock on the sagebrush plateau above Three Forks. The snakes were together at the back of a narrow wedge-shaped recess between the rock and the ground. The immature specimen, 330 mm. long, was collected on an old dirt road in Three Forks at about 8:00 P.M.

All specimens collected are in the Oregon State College Museum of Natural History.

Published records (Van Denburgh, 1922; Brooking, 1934; Gordon, 1939; Anderson and Slater, 1941; and Storm, 1947) indicate the presence of the following uncollected forms in Malheur County:

*Rana pipiens, Crotaphytus collaris baileyi, Crotaphytus wislizenii, Phrynosoma p. platyrhinos, Phrynosoma douglassii ornatissimum, Cnemidophorus t. tesselatus, Eumeces skiltonianus, Coluber t. taeniatus* and *Sonora s. semiannulata.*

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# AN ANNOTATED LIST OF MOSQUITO RECORDS FROM COLORADO

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The original purpose of this report was to assemble data on the mosquitoes of Colorado that have been obtained by personnel of the U. S. Public Health Service, Malaria Control in War Areas and Communicable Disease Center Programs, during the seasons of 1944-1947. However, the original plan was modified and broadened to include all mosquito records from Colorado that have come to the attention of the writer. This action was taken because no recent attempt has been made to bring all published Colorado mosquito records together into a single report and, further, because of the fact that the earlier published records from Colorado are widely scattered in entomological literature.

For convenience the species and the collection data are arranged alphabetically. Names of the principal collectors have been abbreviated as follows: T. D. A. Cockerell, (C); H. G. Dyar, (D); F. C. Harmston, (H); G. F. Knowlton, (K); W. R. Lasky, (L) and L. E. Perry, (P).

## LIST OF SPECIES RECORDED

1. *Aedes campestris* Dyar & Knab.
2. *Aedes canadensis* (Theobald).
3. *Aedes cataphylla* Dyar.
4. *Aedes cinerus* Meigen.
5. *Aedes communis* (De Geer).
6. *Aedes dorsalis* (Meigen).
7. *Aedes excrucians* (Walker).
8. *Aedes fitchii* (Felt & Young).
9. *Aedes flavescens* (Muller).
10. *Aedes idahoensis* (Theobald).
11. *Aedes impiger* (Walker).
12. *Aedes increpitus* Dyar.
13. *Aedes intrudens* Dyar.
14. *Aedes klotsi* Matheson.
15. *Aedes lateralis* (Meigen).
16. *Aedes nearcticus* Dyar.
17. *Aedes nigromaculis* (Ludlow).
18. *Aedes pionips* Dyar.
19. *Aedes pullatus* (Coquillett).
20. *Aedes punctor* (Kirby).
21. *Aedes riparius* Dyar & Knab.
22. *Aedes sticticus* (Meigen).
23. *Aedes stimulans* (Walker).
24. *Aedes triseriatus* (Say).
25. *Aedes trivittatus* (Coquillett).
26. *Aedes vexans* (Meigen).
27. *Anopheles franciscanus* McCracken.
28. *Anopheles freeborni* Aitken.
29. *Anopheles occidentalis* Dyar & Knab
30. *Anopheles punctipennis* (Say).
31. *Anopheles quadrimaculatus* Say.
32. *Culex apicalis* Adams.
33. *Culex pipiens* Linnaeus.
34. *Culex restuans* Theobald.
35. *Culex salinarius* Coquillett.
36. *Culex tarsalis* Coquillett.
37. *Culiseta alaskaensis* (Ludlow).
38. *Culiseta impatiens* (Walker).
39. *Culiseta incidens* (Thomson).
40. *Culiseta inornata* (Williston).

41. *Culiseta melanura* (Coquillett).
42. *Culiseta morsitans* (Theobald).
43. *Mansonia perturbans* (Walker).
44. *Psorophora confinnis* (Lynch Arribalzaga).
45. *Psorophora signipennis* (Coquillett).

### **Aedes campestris** Dyar & Knab

This species was collected in the northwestern section of the state, in the vicinity of alkaline borrow pits. The females were observed to bite readily during the evening, after being disturbed from their resting places in the grass.

Garfield County: Rifle, July 18, 1947 (H). Rio Blancho County: Rangeley, July 17, 1947 (H).

### **Aedes canadensis** (Theobald)

*Canadensis* was taken on two occasions in forested areas above 8000 feet elevation. Larvae were collected from marshy ground pools near the edge of the forests. The females attack during the daytime in shaded, woodland areas.

Clear Creek County: Georgetown, July 19, 1947 (H). Summit County: Frisco, July 19, 1947 (H).

### **Aedes cataphylla** Dyar

This is one of the more troublesome mosquitoes in the mountains of Colorado. The females attack readily in the wooded areas and inflict a painful bite. Along the lower limits of its range it is associated with *canadensis;* at the higher elevations, around 10,000 feet, it occurs with *communis* and *punctor.*

Grand County: Grand Lake, May, 1923 (D), (3); Fraser, May 31, 1923 (D) (3). Larimer County: Estes Park, August 20, 1940 (K). Routt County: Rabbit Ears Pass, May 14, 1947 (H). Summit County: Frisco, July 19, 1947 (H); Loveland Pass, July 19, 1947 (H).

### **Aedes cinereus** Meigen

This species was collected along the foothills of the higher mountain ranges, in the vicinity of wooded streams. It is a persistent biter in the wooded areas during daytime.

Eagle County: Minturn, July 19, 1947 (H). Garfield County: Glenwood Springs, July 19, 1947 (H). Grand County: Grand Lake, July 3, 1923 (D), (3). Moffat County: Craig, June 13, 1947 (H).

### **Aedes communis** (DeGeer)

This species was encountered in the higher mountain areas of the state. The females were observed to bite readily in wooded areas dur-

ing the daytime and in open areas at evening. It occurs in tremendous numbers in many of the higher mountain regions where breeding conditions are favorable and is to be regarded as the most troublesome species within its range.

Clear Creek County: Georgetown, July 17, 1947 (H). Chaffee County: Salida, May 24, 1947 (H). Grand County: Grand Lake, June 3, 1923 (D), (3). Gunnison County: Monarch Pass, May 25, 1947 (H). Summit County: Loveland Pass, July 19, 1947 (H).

### **Aedes dorsalis** (Meigen)

*Dorsalis* was found in all regions of the state except for the higher mountain areas. It is a troublesome species in many of the high valleys but apparently is absent in the wooded localities. *Dorsalis* is the dominant mosquito on the Colorado plains and the most troublesome pest species in the state.

Adams County: Fitzsimons General Hospital, 1944-1945 (L). Alamosa County: Alamosa, August 9, 1944 (P). Arapahoe County: Ft. Logan, July 10, 1944 (P). Bent County: Las Animas, September 6, 1944 (P); May 23, 1947 (H). Delta County: Delta, September 4, 1944 (P). El Paso County: Colorado Springs, 1942 (Portman). Garfield County: Silt, August 11, 1944 (P). Jackson County: Walden, August 24, 1940 (K). Larimer County: Estes Park, August 24, 1940 (K); Ft. Collins, 1941 (James). Mesa County: Grand Junction, August 11, 1944 (P). Moffat County: Craig, July 14, 1944 (P); June 13, 1947 (H). Rio Grande County: Monte Vista, August 9, 1944 (P). Routt County: Hayden, July 14, 1944 (P). Weld County: Greeley, August 8, 1944 (P).

### **Aedes excrucians** (Walker)

Grand County: Columbine Lake, June 2, 1923 (D), (3); Grand Lake, June 21, 1923 (D). Larimer County: Ft. Collins, 1941 (James). This species is recorded by Cockerell, as *Aedes sansoni* from Buena Vista and Salida, in Chaffee County and from Estes Park, in Larimer County.

### **Aedes fitchii** (Felt and Young)

This species was observed to be locally abundant in the foothill regions of both sides of the Continental Divide, and in wooded areas of the higher mountain valleys. Larvae and adults of this species were frequently associated in the same habitat with those of *A. cinereus* and *A. increpitus*. The females bite readily, particularly in the evening.

Adams County: Fitzsimons General Hospital, July, 1945 (L). Eagle County: Red Cliff (C). Grand County: Grand Lake, July 16, 1923 (D), (3) as *A. mimesis*. El Paso County: Palmer Lake, June 21, 1947 (H). Larimer County: Loveland, July 25, 1947 (H); Pingree Park, August 21, 1940 (K). Moffat County: Craig, June 13, 1947 (H); Fortification, June 12, 1947 (H). Weld County: La Salle, April 19, 1947 (H).

### Aedes flavescens (Muller)

One newly-emerged male of this species was taken as it rested upon the surface of a small pool, in the grassy, plains region of northern Larimer County. This pool contained an abundance of *dorsalis* and *nigromaculis* larvae, but attempts to locate larvae of *flavescens* proved unsuccessful.

Larimer County: Virginia Dale, July 25, 1947 (H).

### Aedes idahoensis (Theobald)

This mosquito is a very troublesome pest species in the plains areas and lower mountain valleys over the northern half of the state, particularly on the west side of the Continental Divide. The females attack readily during daytime or evening and inflict apainful bite. It is frequently associated with *dorsalis* and *nigromaculis*.

Chaffee County: Salida (C). Garfield County: Carbondale and Glenwood Srpings (C); Rifle, July 19, 1947 (H). Grand County: Fraser, June 26, 1923 (D); Granby, June 26, 1923 (D); July 14, 1944 (P). Larimer County: Virginia Dale, July 25, 1947 (H). Moffat County: Craig, June 13, 1947 (H); Maybell, June 14, 1947 (H). Pitkin County: Aspen (C). Routt County: Hayden, July 14, 1944 (P). Weld County: Greeley, August 8, 1944 (P).

### Aedes impiger (Walker)

Grand County: Grand Lake, May-June, 1923 (D), (3).

### Aedes increpitus Dyar

*Increpitus* is a common, troublesome species in wooded areas along the foothills and in the higher valleys of the state. Larvae were collected on numerous occasions from overflow pools along wooded streams. The adult females were frequently found in association with *cinereus, fitchii* and *vexans*.

Adams County: Fitzsimons General Hospital, May-July, 1945 (L). EagleCounty: Minturn, July 19, 1947 (H). Garfield County:

Rifle, July 19, 1947 (H). Jefferson County: Golden, July 20, 1947 (H). Larimer County: Ft. Collins, 1941 (James); Pingree Park, August 21, 1940 (K). Mesa County: Grand Junction, July 10, 1946 (H). Moffat County: Craig, June 13, 1947 (H). Montezuma County: Cortez, July 7, 1946 (H). Routt County: Steamboat Springs, July 19, 1946 (H).

**Aedes intrudens** Dyar

Grand County: Grand Lake, May-June, 1923 (D), (3).

**Aedes klotsi** Matheson

Costilla County: Mt. Home Lake, above Ft. Garland, July 20, 1923 (Klots), (6).

**Aedes lateralis** (Meigen)

Boulder County: Reported from Boulder, as *Aedes aldrichii,* by Cockerell (1).

**Aedes nearcticus** Dyar

Alamosa County: Reported from Alamosa, by Matheson (7).

**Aedes nigromaculis** (Ludlow)

This species is widely distributed and abundant in most irrigated farming regions of the state and in the plains country. It was not encountered in the foothill or mountainous areas. Because of its abundance, and the avidity of the females, *nigromaculis* probably ranks next to *dorsalis* in importance as a pest mosquito in Colorado.

Adams County: Fitzsimons General Hospital, June -September, 1944-45 (L). Alamosa County: Alamosa, August 9, 1944 (P); July 9, 1946 (H). Bent County: Las Animas, May 23, 1947 (H). Chaffee County: Salida, May 24, 1947 (H). Eagle County: Glenwood Springs, July 19, 1947 (H). Larimer County: Ft. Collins, 1941 (James); Virginia Dale, July 25, 1947 (H). Las Animas County: Trinidad, August 9, 1944 (P). Mesa County: Grand Junction, August 11, 1944 (P); July 10, 1946 (H). Moffat County: Craig, June 30, 1947 (H); Maybell, June 13, 1947 (H). Montezuma County: Cortez, July 7, 1946 (H). Otero County: La Junta, May 22, 1947 (H). Pueblo County: Pueblo, May 24, 1947 (H). Washington County: Akron (C). Weld County: Greeley, April 19, 1947 (H).

**Aedes pionips** Dyar

Grand County: Grand Lake, June, 1923 (D), (3).

**Aedes pullatus** (Coquillett)

This species was observed to be locally abundant in a number of mountainous areas of the state. The females were observed only in heavily wooded localities; they bite readily, particularly in the evening, inflicting a painful bite. Larvae were taken in grassy pools in the vicinity of timber.

Chaffee County: Salida, May 24, 1947 (H). Eagle County: Glenwood Canyon, July 19, 1947 (H); Minturn, July 19, 1947 (H). Grand County: Grand Lake and Poudre Lake, June, 1923 (D), (3). Gunnison County: Gunnison, May 25, 1947 (H); Monarch Pass, May 25, 1947 (H). Larimer County: Estes Park, July, 1923 (D), (3); Pingree Park, August 21, 1940 (K). Las Animas County: Trinidad, August 9, 1944 (P). Routt County: Steamboat Springs, July 19, 1946 (H). Cockerell reports this species, as *A. acrophilus,* from Chaffee, Eagle and Pitkin Counties.

**Aedes punctor** (Kirby)

Grand County: Grand Lake, June 19, 1923 (D); Poudre Lake, July 4, 1923 (D), (3). Summit County: Loveland Pass, July 20, 1947 (H).

**Aedes riparius** Dyar and Knab

Grand County: Columbine Lake, June 22, 1923 (D), (3).

**Aedes sticticus** (Meigen)

Adams County: Fitzsimons General Hospital, August, 1945 (L). Chaffee County: Salida, May 25, 1947 (H). Gunnison County: Gunnison, May 25, 1947 (H). Moffat County: Craig, June 13, 1947 (H); Elk Springs, June 14, 1947 (H).

**Aedes stimulans** (Walker)

Eagle County: Minturn (C), (1). Las Animas County: Trinidad, August 9, 1944 (P). Teller County: Florissant (C), (1). *Stimulans* is reported from Colorado by Olson and Keegan (8), but no specific locality is given.

**Aedes triseriatus** (Say)

Adams County: Fitzsimons General Hospital, July-September, 1945 (L). Arapahoe County: Ft. Logan, July 10, 1944 (P). El Paso County: Colorado Sprigns, 1942 (Portman). Larimer County: Loveland, July 25, 1947 (H).

**Aedes trivittatus** (Coquillett)

Adams County: Fitzsimons General Hospital, June-August, 1944-45 (L). Arapahoe County: Ft. Logan, 1941 (Portman). Boulder County: Longmont, July 25, 1947 (H). Larimer County: Ft. Collins, 1941 (James), (4). Pueblo County: Pueblo, September 5, 1944 (P). Routt County: Hayden, July 14, 1944 (P). Dyar (3), comments on this species as follows: Denver, August (Tucker), originally recorded as *Culex pipiens,* and again as *Culiseta inornatus.*'"

**Aedes vexans** (Meigen)

In Colorado this species breeds abundantly in overflow pools along wooded streams, in flooded borrow pits and in waste irrigation water. It is widely distributed over the foothills and in the plains and irrigated farming regions but was not encountered in mountainous areas above 8000 feet elevation. It probably ranks third, behind *dorsalis* and *nigromaculis,* in importance as a pest species in the state.

Adams County: Fitzsimons General Hospital, May-August, 1944-45 (L). Arapahoe County: Ft. Logan, September 8, 1944 (P). Bent County: Las Animas, September 6, 1944 (P). Boulder County: Boulder, August 24, 1940 (K); Longmont, July 25, 1947 (H). Costilla County: Ft. Grland, August 8, 1944 (P). Denver County: Denver, September 6, 1917 (C); September 6, 1944 (P). Eagle County: Eagle, August 10, 1944 (P). Fremont County: Canon City, May 23, 1947 (H). Garfield County: Rifle, July 19, 1947 (H). Gunnison County: Gunnison, September 4, 1944 (P). Jefferson County: Golden, July 20, 1947 (H). Larimer County: Ft. Collins, 1941 (James); Virginia Dale, July 25, 1947 (H). Moffat County: Craig, July 13, 1947 (H). Otero County: La Junta, May 22, 1947 (H). Pueblo County: Pueblo, September 5, 1944 (P). Rio Blanco County: Rangely, July 17, 1947 (H). Routt County: Steamboat Springs, July 19, 1946 (H). Weld County: Greeley, August 8, 1944 (P).

**Anopheles franciscanus** McCracken

Widely scattered over the southern half of the state.

Bent County: Las Animas, September 6, 1944 (P). Cheyenne County: Wild Horse, September 6, 1944 (P). Delta County: Delta, September 4, 1944 (P). Eagle County: Glenwood Springs, July 19, 1947 (H). La Plata County: Ignacio, September 12, 1946 (H). Lincoln County: Limon, September 6, 1944 (P). Logan County: Sterling, September 8, 1944 (P). Mesa County: Grand Junction, August

11, 1944 (P); July 10, 1946 (H). Prowers County: Lamar, September 6, 1944 (P). Pueblo County: Pueblo, September 5, 1944 (P).

### **Anopheles freeborni** Aitken

*Freeborni,* the western malarial mosquito, is widely distributed in the state, west of the Continental Divide. It is recorded from a few localities east of the Divide, in the southcentral part of the state.

Chaffee County: Salida, September 5, 1944 (P). Delta County: Delta, September 4, 1944 (P). Dolores County: Dove Creek, July 7, 1946 (H). Eagle County: Eagle, July 19, 1947 (H); Glenwood Springs, August 10, 1944 (P). Fremont County: Canon City, September 5, 1944 (P). Garfield County: Rifle, July 18, 1947 (H); Silt, August 11, 1944 (P). Mesa County: Grand Junction, August 11, 1944 (P); July 10, 1946 (H). Montezuma County: Cortez, July 7, 1946 (H). Pueblo County: Pueblo, September 5, 1944 (P). Rio Blanco County: Meeker, July 17, 1947 (H). Olson and Keegan (8) record the occurrence of *freeborni* in Colorado, but do not list the specific locality.

### **Anopheles occidentalis** Dyar and Knab

Arapahoe County: Ft. Logan, July 6, 1944 (P); August 1, 1944 (Olson and Keegan), (9). Clear Creek County: Georgetown, July 19, 1947 (H). Jefferson County: Golden, July 20, 1947 (H). Larimer County: Loveland, July 25, 1947 (H).

### **Anopheles punctipennis** (Say)

Larimer County: Virginia Dale, July 25, 1947 (H). Logan County: Sterling, September 8, 1944 (P). Pueblo County: Pueblo, June 23, 1944 (Olson and Keegan), (9).

### **Anopheles quadrimaculatus** Say

This species has been recorded by Cockerell (1), from Delta and Hotchkiss in the west-central part of the state. Dyar (3), refers to these records but states that the occurrence of *quadrimaculatus* in western Colorado remains uncertain until verified by a male.

Study of several hundred *Anopheles* adults and larvae taken in western Colorado during the seasons of 1944-46 has shown all to be either *occidentails, franciscanus* or *freeborni.* The latter species is widely distributed over the western half of the state and is particularly numerous near Delta and Hotchkiss; the records of Cockerell probably refer to this species.

**Culex apicalis** Adams

Adams County: Fitzsimons General Hospital, May 17, 1945 (L). Arapahoe County: Ft. Logan, August 12, 1944 (Olson and Keegan). Boulder County: Longmont, July 25, 1947 (H). Jefferson County: Golden, July 20, 1947 (H).

**Culex pipiens** Linnaeus

Adams County: Aurora, June 9, 1944 (P); Fitzsimons General Hospital, August-October, 1944-45 (L). Boulder County: Longmont, July 25, 1947 (H). Garfield County: Rifle, July 19, 1947 (H). La Plata County; Durango, September 13, 1946 (H). Moffat County: Craig, June 13, 1947 (H).

**Culex restuans** Theobald

Adams County: Fitzsimons General Hospital, August-September, 1944 (L). Denver County: Denver, July 23, 1947 (H). El Paso County: Colorado Springs, 1942 (Portman); reported as *territans* Walker. Garfield County: Glenwood Springs, July 19, 1947 (H); Rifle, July 18, 1947 (H).

**Culex salinarius** Coquillett

Adams County: Fitzsimons General Hospital, September, 1944 (L). Arapahoe County: Ft. Logan, August 22, 1944 (Olson and Keegan). Boulder County: Longmont, July 25, 1947 (H). El Paso County: Camp Carson, June 29, 1944 (Olson and Keegan). Rio Blanco County: Rangely, July 17, 1947 (H).

**Culex tarsalis** Coquillett

This is one of the more important pest mosquitoes in Colorado. It was not encountered in the mountainous regions above 7500 feet elevation, but is widely distributed elsewhere. The females readily enter dwellings and bite avidly. It has been taken by U. S. Public Health Service personnel in the following counties: Alamosa, Arapahoe, Bent, Chaffee, Cheyenne, Costilla, Delta, Denver, Dolores, El Paso, Fremont, Garfield, Huerfano, Las Animas, Lincoln, Moffat, Montezuma, Montrose, Otero, Prowers, Rio Grande, Routt, Saguache and Weld. Other records are as follows: Boulder County: Boulder, August 23, 1940 (K). Jefferson County: Golden, September 6, 1917 (C). Larimer County: Ft. Collins, 1941 (James).

**Culiseta impatiens** (Walker)

Chaffee County: Buena Vista, August 10, 1944 (P); Monarch

Pass, May 25, 1947 (H). Clear Creek County: Georgetown, July 19, 1947 (H). Fremont County: Canon City, May 24, 1947 (H). Grand County: Grand Lake, May-June, 1923 (D), (3). Summit County: Loveland Pass, July 19, 1947 (H). Dyar (3), reports the species from Whittier Range, Cochetopa National Forest.

**Culiseta incidens** (Thompson)

Adams County: Fitzsimons General Hospital, July-September, (L). Boulder County: Longmont, July 25, 1947 (H). Chaffee County: Buena Vista, September 5, 1944 (P). Costilla County: Ft. Garland, August 9, 1944 (P). El Paso County: Colorado Springs, 1942 (Portman). Garfield County: Rifle, July 18, 1847 (H). Gunnison County: Gunnison, May 25, 1947 (H). Larimer County: Virginia Dale, July 25, 1947 (H). Lincoln County: Limon, September 6, 1944 (P). Mesa County: Plateau Canyon, August 23, 1906 (Dyar), (3). Montrose County: Cimarron, September 4, 1944 (P).

**Culiseta inornata** (Williston)

This species is widely distributed in the state at elevations below 8000 feet. Over most of its range it is associated with *Culex tarsalis*.

Adams County: Bennett, September 6, 1944 (P); Fitzsimons General Hospital, May-October, 1944-45 (L). Alamosa County: Alamosa, August 9, 1944 (P). Arapahoe County: Ft. Logan, July 10, 1944 (P). Chaffee County: Salida, September 4, 1944 (P). Costilla County: Ft. Garland, August 9, 1944 (P). Denver County: Denver, July 8, 1944 (P). Dolores County: Dove Creek, July 7, 1946 (H). Fremont County: Canon City, May 23, 1947 (H). Garfield County: Glenwood Springs and Rifle, July 19, 1947 (H); Silt, August 11, 1944 (P). Las Animas County: Trinidad, August 9, 1944 (P). Moffat County: Craig, June 13, 1947 (H). Morgan County: Ft. Morgan, September 8, 1944 (P). Rio Blanco County: Meeker, July 17, 1947 (H). Rio Grande County: Monte Vista, August 9, 1944 (P). Weld County: Greeley, August 8, 1944 (P).

**Culiseta melanura** (Coquillett)

Adams County: Fitzsimons General Hospital, June-August, 1944 (L); July 14-31, 1944 (Olson and Keegan).

**Culiseta morsitans** (Theobald)

Adams County: Fitzsimons General Hospital, 1945 (L); May-

August, 1944 (Olson and Keegan). Las Animas County: Trinidad, July 11, 1944 (Olson and Keegan.)

**Mansonia perturbans** (Walker)

Boulder County: Longmont, July 25, 1947 (H). Garfield County: Rifle, July 18, 1947 (H).

**Psorophora confinnis** (Lynch Arribalzaga)

Arapaho County: Lowry Field, July 17, 1944 (Olson and Keegan).

**Psorophora signipennis** (Coquillett)

Adams County: Fitzsimons General Hospital, June-August, 1945 (L). Larimer County: Ft. Collins, 1941 (James); Loveland, July 25, 1947 (H). Rio Blanco County: Meeker, July 17, 1947 (H).

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## White-lined Sphinx Moth Abundant in Central Utah Spring 1949

While collecting at Cherry Creek and Topaz Mountain in Juab County, on May 27-30, 1949 with Drs. L. D. Pfoutz and C. Hopkins, I was impressed with the abundance of the adults of the white-lined sphinx moth, *Celerio lineata* (Fabr.). The moths were common at twilight, flying around the camp fire. Some of them came too close to the fire and got their wings singed. Several specimens were taken. In Provo I observed adults of this sphinx in the flower gardens as early as April 30 this year. Several people called to report this fact and to find out if some of the large females were not humming-birds.

These moths laid their eggs, which have hatched into larvae, and are now, June 18, about 70 to 88 mm in length. The larvae are feeding on the Mustard *Norta altissima* (L) and Knotweed, *Polygonum sawatchense* Small and many other plants along the foothills east of Provo, and in Cedar Valley west of Utah Lake.

People have noticed them and wondered if they would move into their fields and damage the crops. This will probably not happen since the majority of the larvae are mature, and will soon pupate in the ground. There are two broods in a year, hence these larvae, which pupate, will after a few weeks hatch into moths. Mr. Ivan Sack, supervisor of the Uinta forest, with offices in Provo, accompanied the writer along the fire break east of Provo; here we observed a mighty hord of green blackish stripped larvae consuming the plants of the foot hills, principally those plants listed above.

This outburst in numbers of the white-lined sphinx is probably the result of several years of increase in its population which has now resulted in producing the enormous numbers of larvae as recorded here. Natural biological control will, no doubt, reduce the population in subsequent years. Here is a good example of the increase and decline of numbers within an insect species. The pages of biological literature are replete with examples of the upsurge in numbers of individuals of many species. Likewise the decline from the peak increase is also a part of the recorded data. The available food, along with the parasites and enemies, will ultimately limit the increase of any animal.—Vasco M. Tanner.

# INDEX TO VOLUME IX

The species described in this volume appear in bold-face type in this index.




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